GENERAL LIBRARY
UNIV. OF MICH.
SEP 18 1899

THE IRON TRADE REVIEW

VOLUME XXXII. CLEVELAND, O. · MARCH 16, 1899. CHICAGO, ILL. NUMBER 11

Producers of CONNELLSVILLE COKE ONLY
For Blast Furnace and Foundry Cupola Work; also Crushed Connellsville Coke (substitute for Anthracite Coal) for manufacturing and domestic purposes. 13,500 Ovens. Daily capacity, 30,000 tons of Coke. Direct connections with all railroads entering the region.
Quotations, Freight Rates, Pamphlets giving full information, promptly furnished on application.
Post Office, PITTSBURG, PA.
Mines and Ovens in the Connellsville Coke Region, Pa.

The only reasons that higher prices are being constantly paid by the most prominent steam users in the United States for Cahall Boilers are—that they are better made, last longer, cost less for maintenance, show a higher efficiency and make drier steam than any other kind.
Send for illustrated catalogue.
Cahall Sales Department, Pittsburg, Pa.

THE HARRINGTON & KING PERFORATING CO.
Metals Perforated as Required
FOR SCREENS OF ALL KINDS FOR USE IN
Milling and Mining Machinery, Reduction and Concentrating Works, Woolen, Cotton, Paper and Pulp Mills, Rice, Flour and Cottonseed Oil Mills, Sugar and Malt Houses, Distilleries, Filter Presses, Stone, Coal and Ore Screens, Stamp Battery Screens, Brick and Tile Works, Filters, Spark Arresters, Gas and Water Works, Oil, Gas and Vapor Stoves, Coffee Machinery, Etc., Etc.
Standard Sizes Perforated Tin and Brass Always in Stock.
Main Office and Works: 226 North Union Street, Chicago, Ill., U.S.A.

..Fire Brick..
Ground Clay A SPECIALTY. Special Shapes.

IT PAYS to advertise in The Iron Trade Review.

The Union Boiler Tube Cleaner Co.
231 Penn Ave., Pittsburg, Pa.
Has set the acknowledged standard for the World, for removing all conditions of scale from all makes of Water Tube Boilers. Adopted by all the largest manufacturing concerns in the country. We have the only FLEXIBLE SHAFT of remarkable strength and phenomenal durability under great stress. Write for particulars. Agents wanted.

See large Advertisement of
B. F. STURTEVANT CO.,
Boston, Mass..
On Page 25.
BLOWERS, FANS, ENGINES.

W. S. ROCKWELL & CO.,
OIL FURNACES.
26 Cortlandt St., New York City.

MINING ENGINEER, CHEMIST, ASSAYER.
BENEDICT CROWELL,
Atwater Building, Cleveland.

ENTERPRISE BOILER COMPANY
YOUNGSTOWN, O.
Draught Stacks, Blast Furnaces and Heavy Plate Work a Specialty.
Write for Estimates.

POWER TRANSMISSION
W.A. JONES FOUNDRY & MACHINE CO.
53-59 So. JEFFERSON ST. CHICAGO.

HONEST BABBITT METALS.
We do not claim that we are supplying ten different governments with Babbitt Metal. Our Metals are used by more than three thousand leading Consumers in UNCLE SAM'S own country. They are invariably uniform, reliable, contain only pure and best material, remarkably fluid, and free from "drossing."
PRICES TO ALL.—XXX Nickel Babbitt 24 cts. per lb.; No. 2 Grade (for general shop use), 10 cts. per lb.; F. O. B. your depot, on your customary terms. Any special mixture of metal made to order. 3,000 References.
SWARTS METAL REFINING CO., Office and Works, 20 N. Desplaines St., Chicago, Ill.

TURNBUCKLES.

Cleveland City Forge & Iron Co.,
CLEVELAND, O.

Blakeslee Steam Jet Pump.

REASONS FOR ITS USE:
1. Simplicity. 2. Is independent of engine. 3. Will pump sandy or impure water. 4. Have no valves and no wear. 5. Not subject to freezing. 6. Economy and reliability. 7. All parts interchangeable. Write
BLAKESLEE MFG. CO., Du Quoin, Ill.

LAKE SUPERIOR PIG IRON.
For Grey Iron, Malleable and Car Wheel Castings.
PURITAN
GENUINE CONNELLSVILLE COKE.
FORSTER, WATERBURY & CO.,
636-638 Rookery, CHICAGO

THE CHICAGO SCREW CO.

A NEW TOOL! Made in seven sizes.

MANUFACTURED ONLY BY
Armstrong Bros. Tool Co., 106 W. Wash. St., Chicago, Ill.

If a sheet or half-sheet of Apollo galvanized iron has any fault, no matter how slight, send it back to your jobber at his expense.
Apollo Iron and Steel Company, Pittsburgh.

The Bourne-Fuller Co.,
DISTRIBUTORS OF
APOLLO PRODUCTS.
Cleveland, O.

Bristol's Patent Steel Belt LACING.

Most Perfect fastening for all kinds of Belting.
Samples free.
THE BRISTOL CO., Waterbury, Conn.

FUEL GAS PLANTS.
American Gas Furnace Co.,
23 John St., N. Y.

WORKS, SHARON. MINES, CLEARFIELD CO., PA.
James V. Rose.
. . . PROPRIETOR . . .
SHARON FIRE BRICK WORKS,
Contractor in Fire Brick Construction.
Manufacturer of High Grade Fire Brick.

ANALYSIS:

Brick.		*Rock Clay.*	
SILICA,	54.50.	SILICA,	47.80.
ALUMINA,	44.20.	ALUMINA,	39.60.
LOSS ON IGN,	.05.	LOSS ON IGN,	13.30
IRON,	.15.	IRON,	.12.

SHARON, ... PA.

The A B C of Iron, Now $1.

THE UPSON NUT CO., Cleveland, O.
- - - MANUFACTURERS OF - - -
MACHINE AND CARRIAGE BOLTS, HOT FORGED AND COLD PUNCHED NUTS, LAG SCREWS, BOLT ENDS, WASHERS, ETC. Catalogue and Prices on Application.

Riveted Steel Pipe, Stand Pipes, Receivers.

The WM. B. POLLOCK CO.

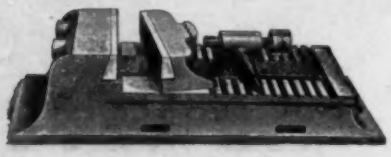
with inquiry please give ad. No. 6.

YOUNGSTOWN, O.

Blast Furnaces, Steel Plants, Boilers, Tanks, etc.

H. B. Lusch
DEALER IN
COMMERCIAL PAPER
88 WASHINGTON ST. - CHICAGO.
CORRESPONDENCE INVITED

Chucks Work Instantly Parallel with Bed of Chuck



Massey's Planer and Drill Press Chuck.
MASSEY VISE CO., Chicago Ill.

Stilwell's Patent
Lime Extracting
Heater
AND
Filter
COMBINED.

Is the only lime extracting Heater that will prevent scale in steam boilers. Removing all impurities from the water before it enters the boiler.

Thoroughly Tested.
Over 8,000 of them in daily use.

The Stilwell-Bierce & Smith-Vaile Co.,
Dayton, Ohio.

AULTMAN

Reduce your expenses and increase your profits by using labor saving appliances wherever practicable. Submit your problems and ideas to us, and we in turn will submit designs and estimates for your approval. Write us. Catalogue "C" on application.

THE AULTMAN COMPANY,
908 South Market Street,
CANTON, OHIO, U.S.A.

12 Standard Types **AIR COMPRESSORS** with a large number of Special Patterns,

Covering the requirements of every application of compressed air. Each machine equipped with the most improved accessories relating to the economical production of compressed air. Send for new catalogue.

Rock Drills, Stone Channelers. | THE **Ingersoll-Sergeant** Drill CO., Cleveland, New York. | Coal Cutters. The Pohle Air Lift Pumps.

The Bourne-Fuller Co.,
IRON, STEEL
AND
PIG IRON.
Cleveland, - Ohio.

AIR COMPRESSORS

Thoroughly up-to-date and the most simple, durable and economical machines on the market. Built on improved lines.

ROCK DRILLS, AIR LIFT, PUMPS, ETC.
Send for catalogue

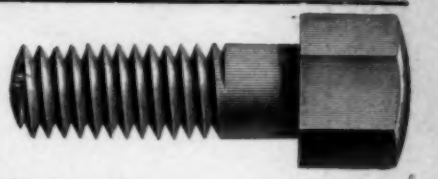
RAND DRILL CO.
100 Broadway, New York.
1328 Monadnock Block, Chicago.

O. TEXTOR,
Chemist, Metallurgist and Assayer.

Analyses made of Metals, Ores, Fuels and Supplies for Furnaces, Steel Works and Foundries.
Ores sampled at mines, furnaces and lake ports.
Advice furnished to operators of Blast Furnaces Steel Works and Foundries.
Mining properties reported upon.
168 Superior St. CLEVELAND, O.

A B C OF IRON,
NOW $1.00.

Rockford Bolt Works, Rockford, Ill.
ALL KINDS OF
Bolts, Lag Screws, Rivets, Washers and Odd Bolt Work.



Mention the Iron Trade Review.

THE IRON MASTERS' LABORATORY, Established 1866.
J. Blodget Britton & Co., Analytical and Consulting Chemists,
Warrenton, Virginia, formerly located 339 Walnut Street, Philadelphia.
Analyses of Iron Ore, Iron, Steel, Coal and Coke, Slag, Limestone, Clay, Fire Brick, Water, etc.

AIR COMPRESSORS
For every application of Compressed Air Power.

Complete Catalogue upon application.
Clayton Air Compressor Wks.
26 Cortlandt St., NEW YORK.

Cable Address "METALFAC-CHICAGO" A B C Code
E. H. STROUD & CO.,
METAL FACTORS.
The Products of and Supplies for
IRON · STEEL · TIN-PLATE · BRASS
COPPER · LEAD & · ZINC · WORKS.
36 La Salle Street 100 William Street
CHICAGO. NEW YORK.

THE ROBERT W. HUNT & CO.,
Bureau of Inspection, Tests and Consultation.
PITTSBURG: Park Building. CHICAGO: 1187 The Rookery. NEW YORK: 71 Broadway.
Reports on iron and steel processes and plants. Inspection of steel rails, splice bars, railroad cars, wheels, axles, etc. Chemical Laboratory—Analysis of ores, iron, steel, oils, water, etc. Physical Laboratory—Test of metals, drop and pulling test of couplers, draw bars, etc. Efficiency tests of boilers, engines and locomotives.

F. A. EMMERTON.
Analytical Chemist,
AND METALLURGIST.
Ores sampled at lake ports, mines and furnaces.
Mines and Metallurgical Processes examined.
Analyses made of Ores, Metals, Fuels, Railroad and Foundry Supplies, etc.
9 Bratenahl Building, CLEVELAND, O.

John T. Jones & Co.,
Mines, Prospects, Explorations and Mineral Lands, examined, experted, practical tests made and reported. Reliable and practical sampling done. Chemical analysis made. All work done by practical expert. Best of reference as to experience and reliability. Address
Suite 32, 115 Monroe St.,
MONTAUK BLOCK, CHICAGO, ILLS.

Millett's Patent
CORE OVEN.
The best in the world.
MILLETT CORE OVEN CO., Brightwood, Mass.

DICKMAN & MACKENZIE,
CHICAGO,
1234 Rookery Building.
Mining properties examined. Ores sampled at mines, furnaces and all lake ports.
General analyses of Ores, Slags, Metals, Fuel, Foundry Materials and Products, etc.
CHEMISTS AND ENGINEERS.

Subscribe for the Iron Trade Review.

THE IRON TRADE REVIEW

VOLUME XXXII. CLEVELAND, O. MARCH 16, 1899. CHICAGO, ILL. NUMBER 11

THE WEEK IN IRON CIRCLES.

THE MARKET AT LARGE.

There is not the slightest sign of a halt in the upward march of prices, nor of abatement in demand. Meantime the supply of material lessens. This is particularly noticeable in pig iron because it is statisically followed. The inroad upon stocks in February was more than 50,000 tons; and buyers who have had a general, hazy impression that because of preparations here and there to get old stacks into line the situation would be eased up, may have been surprised at a smaller active capacity March 1 than on Feb. 1. Furnaces do not escape the liability to stoppage for repairs even in times of bounding values, unfortunately for their owners. It should be taken as a fundamental fact in calcluations for the future that no early increase of any significance can be made in the pig iron producing capacity of the country, either in Bessemer or non Bessemer irons. Preparations that involve organizing forces to reopen old ore properties, as is being done in parts of New York, Pennsylvania and Virginia, are not completed in a week or a month; and the repair of stacks, procuring of equipment and supplies, means a vast amount of detail. Later in the year something may be heard of these furnaces in the statement of pig iron production, but calculations that they will exert any material influence on prices for 1899 may be disappointed. The Chicago district appears to have led in the making of considerable sales of iron for the second half of the year. Buyers of foundry grades, who wanted to know well in advance the source of at least a part of their second six months' supply took lots running into thousands of tons, at current figures, establishing $14.50 Chicago for No. 2 foundry, with some quotations above that figure to-day. The fact that furnaces have been getting behind in shipments recently has roused some buyers to the necessity of being forehanded on their July-December supply. Some sellers of Southern iron have been attempting to withdraw from the market by quoting considerably above reported sales, but buyers accept the offers, and thus the volume of sales is being increased steadily. In the East sales have been made the past week at $5 a ton above the basis of October and November and the Philadelphia quotation to-day is $15 for No. 2X foundry. Bessemer pig iron has been nominally $13.50 at valley furnace since the meeting of producers last week, but a few lots outside of furnacemen's hands have appeared and on these prices ranged from $14 to $15. The basis for third quarter sales is likely to be fixed at Saturday's meeting and is not now expected to be below $14 valley furnace. Billets are $25 Pittsburg, though a market can scarcely be said to exist. The National Steel Co. has made no price as yet on billets or sheet bars for the second half. In respect to the export trade in pig iron and steel, about which there is some concern, under steady advancing prices, it appears to be the policy of those who have entered upon foreign campaigns, to take care of the trade as it comes and not drive it away by quoting prohibitory prices, but it is evident that there is a lull in the aggressive pursuit of this business. There is scarcely a line of finished material that has not advanced in the past week, and there are yet no data on which to answer the continuing query as to the distance yet to be traversed to get to the summit. Bars are making up for time lost, by a rapid movement. Pittsburg mills are quoting from 1.45c to $1 and $2 a ton higher, and mid-summer delivery is the best some of them can do. Bar iron capacity is unequal to the demand, and long idle puddling mills are being started; but forge iron is the drawback here. Plate mills are quoting 2c on deliveries after the middle of the year, but buyers are worrying less about the future than about what they must have and cannot get week by week. Sheets are advancing by weekly stages, and on No. 27 Pittsburg prices range from 2.40c to 2.60c. Pipe and tube mills are bare of stocks, but owing to the uncertainty about steel and to the pending consolidation are not selling far ahead. Wire and nail prices have advanced 15 cents since last week and wire nails are now $2 base at Cleveland or Pittsburg mill, carload lots. The consolidation schemes are moving with more or less dispatch. The Western rolling mill deal is in a more hopeful condition and the sheet mill and wrought pipe amalgamations are expected to take definite shape very shortly.

PITTSBURG.

OFFICE OF *The Iron Trade Review and Industrial World*, 705 PUBLICATION BUILDING, March 15.

The general iron and steel market has quieted down somewhat in the past week, so that there is less pressure to purchase, but on account of the fully sold-up condition of producers, this has not tended in the least to reduce the rate of the upward movement in prices. There is the same difficulty in securing deliveries on contracts that has characterized the business for some time past, though mills have yielded no more than could be expected to the temptation to sell all possible product at the inviting figures which have ruled.

As the year advances, no indications can be found of weakness likely to develop in the latter half, and there is every reason to believe that the present strength will continue. The fear of a reaction which would carry prices below their just proportion has caused conservative action for some time past, which gives the market a strength not apparent on the surface. The coke producers and the ore men are the only ones who have not had a good share of the recent prosperity, and while their time can scarcely come this year, because furnacemen, especially in coke, have quite fully covered for the entire year, yet no weakness can develop in this quarter. There is some talk of the coming into the producing field of blast furnaces long inactive, but the character of the equipment in these cases, and the difficulty of securing raw material, will ensure that the bringing into operation of even a large additional capacity cannot seriously affect prices.

Buying during the week has been only of a spasmodic character, to supply the most pressing wants, and it is well understood that the great bulk of the tonnage now being moved was sold at comparatively very low prices, so that the great effort being made now is to hold the market steady for the latter half of the year. Practically no selling has yet been done even for the third quarter, except in two or three lines, where the conditions necessitated purchasers establishing their status. In nearly every line this week we have to record advances. In all grades of pig iron, in steel billets, in merchant pipe, in angles—other structural shapes remaining unchanged—and in both universal and sheared plates.

PIG IRON.—The sales committee of the Valley Furnacemen's Association met in Cleveland Monday, but took no action in regard to prices. Another meeting is to be held in Cleveland on Thursday of this week, at which a decision will no doubt be reached. Thursday last action was taken regarding a few enquiries, and a few small sales were made at $13.50, valley furnace. It may be interesting to note that the committee takes action on all enquiries, before any sale is made, and fixes the price. There is, therefore, to-day no open quotation by the Valley furnaces, and there is much conjecture as to what action will be taken at the meeting Thursday. It is certain

that sales will be made for at least the third quarter, and perhaps the fourth, and the price may be anywhere from $14 to $15 at furnace. Some speculative lots, long forgotten, have come to light in the past few days, and it is claimed sales have been made from them at $14.90 and $15, but they are of no importance, and can scarcely be said to indicate the market. In the Pittsburg district there is practically no Bessemer iron to be had before July 1, and in the valleys very little indeed. In foundry iron there is a very decided scarcity, and belated buyers are hunting everywhere for small quantities to supply pressing needs. Sales during the week have been mainly 25 and 50 ton lots, though the total may reach several thousand tons. Southern foundry, which was forced entirely out of the market some time ago owing to advances in furnace price and freights, now appears as a possible factor, the price having advanced more than at Southern furnaces, though they have been rapidly filling up, and their quotations have been advancing now almost from day to day. Southern No. 2 might be brought in for about $15, while the local market shows a very wide range, $14 being certainly the lowest done within a week from date, while it is claimed sales at $15.25 have been made. Some lots of No. 2 might be secured to-day at about $14.50, with No. 1 and No. 3 about 50 cents a ton higher and lower respectively. In gray forge there is a very decided scarcity, and as high as $14, Pittsburg, has been asked, and will probably have to be paid, while $13.50 has been done and it is doubtful if much below this has been done within the week. The valley is taking care of itself in mill iron, and the full freight differential of 65 cents does not prevail, the valley market being certainly not over 50 cents below Pittsburg. We quote as follows, the Bessemer figures being scarcely more than nominal:

Bessemer, valley furnace	$13.50	to	15.00
Bessemer, Pittsburg			
No. 1 Foundry	14.50	to	15.50
No. 2 Foundry	14.25	to	14.25
No. 3 Foundry	13.75	to	14.00
Gray Forge, valley furnace	13.00	to	13.50
Gray Forge, Pittsburg	13.50	to	14.00

STEEL.—The small sales of steel billets now being made are confined very largely to sales by holders at second hand, it being an exceptional case when a mill succeeds in finding an opportunity to sell further. No sales are being made as yet for the third quarter, at least in an open way. Sales during the week closing to-day have ranged from $24 to $25, and to-day the market may safely be put at $25 to $26, although these figures may be considered largely nominal. We note a sale last week of 300 tons by a local producer at $25. There is practically no open-hearth steel to be had. The last sales were made at about $30. No selling has yet been done in sheet bars by the newly formed National Steel Co. and it is not known when it will be in the market.

FERRO-MANGANESE.—There is no particular change to note in this line and prices range from $55 to $60 for domestic 80 per cent.

STRUCTURAL MATERIAL—There is prospect of a very heavy demand for structural material this summer, and mills are already figuring on a very large tonnage. Angles have been advanced $1 a ton, beams, channels and zees remaining as formerly. Universal mill plates, which are very scarce, have been forced to 2c a pound by the strong position in sheared plates. We quote: Beams and channels, 3 to 15 inches, 1.40c; 18 to 24 inches, 1.50c; tees, 1.45c; zees, 1 40c; and angles, 1.35c; universal mill plates, 2c.

RAILS AND TRACK MATERIAL.—The increasing strength in all lines has forced track material up, links and pins being especially affected on account of the advance in steel bars, which are now held at 1.45c. In rails the market is nominal. There is a very pronounced shortage of light sections. We now quote track material as follows: Spikes, 1.60c; track bolts, 1.80c to 1.85c; splice bars, 1.40c; links and pins, 1.60c to 1.70c.

BARS.—Steel bars have scored another advance, and are now held firmly at 1.45c a pound, while iron bars are all of 1 40c. The movement to consolidate the Central Western bar mills is being quietly pursued. It will not include the Pittsburg producers.

PLATES.—Producers are practically out of the market for the balance of the first half-year, and the uncertainty as to prices of raw material prevents any extensive figuring for the third quarter. In a limited way 2c has been quoted for the third quarter, and in the absence of material for delivery before July 1 this really constitutes about the market. The sale of the Shoenberger plant to the American Steel & Wire Co., noted last week, may tend to restrict the capacity, as at least the Bessemer steel product of the plant will doubtless all go into wire products, although the plate mill may still be operated on the open-hearth steel produced in the plant. We quote the following nominal figures: Tank plate, 2c; shell, 2.05c; flange, 2.10c; fire box, 2½c to 3½c.

SHEETS.—The sheet mills are now refusing to sell more than from 30 to 60 days ahead, although sales made some time ago ran up to July 1. There is a great range of prices, the heavier gauges, on account of scarcity, sometimes bringing prices disproportionate to those on the lighter gauges. Mills are unwilling to accept offers made at 2.30c and 2.35c for No. 28 common, one pass through cold rolls, and it is claimed as high as 2½c, or even higher, has been paid. Steady work is being done on the consolidation project, which is certain to be successful, but it is claimed that no formal options have yet been given. It is stated that all the mills, without exception, are favorable to the movement. In galvanized the market has been rather steady, owing to the decline in spelter evening up the increased strength in black sheets, and 75 per cent off is the ruling quotation, although 75 and 5 might possibly be secured.

PIPES AND TUBES.—The wrought pipe market is quite bare of stocks, with no diminution in demand. Mills are unwilling to sell ahead, owing to the uncertainty still surrounding raw material. Consolidation preparations are going on steadily, options having been called for by the promotors from all the mills, and action is being taken by directors of various companies. Five or six options are not in as yet. Merchant pipe was advanced on Saturday and the discount now is 60 per cent, with five 10's additional for less than carload lots and an extra 5 for carload lots, with free delivery on the latter quantity within prescribed territory. The discounts from the new list on lapweld casing are 52½ and 10 for screw and socket joint casing and 52½ on inserted joint casing, with an extra 5 per cent on carload orders.

SPELTER.—The spelter market has dropped further since last report, but is still above 6c, and we quote the range about as follows: New York, 6.20c; Pittsburg, 6.10c; St. Louis, 6c.

IRON AND STEEL SKELP.—Practically nothing has been done in the skelp market for some time, and prices are difficult to quote. Some large tonnage is now being figured on. For the present we quote as follows: Grooved iron skelp, 1.25c to 1.32½c; sheared iron skelp, 1.45c to 1.50c, grooved steel, 1.20c to 1.25c; sheared steel skelp, 1.40c to 1.50c.

OLD MATERIAL.—There is very little doing in the scrap market, supplies having already been well cleared up. Melting scrap is a trifle higher than at last report, as are old rails. We quote: Melting stock, $12.50 to $12.75; old steel rails, long lengths, $11.50 to $11.75; cut, $12 to $12.25; old iron rails, $17; wrought iron scrap, $13 to $13.50 valley; cast borings, $7 net, valley; busheling scrap, $9.50 to $10, net; car wheels, $12 to $12.50 gross; cast scrap, $10 gross; charcoal scrap, $11 gross; wrought turnings, $7 to $7.50 net, valley.

COKE.—The coke market is uneventful. There is little talk regarding furnace coke for the second half of the year, as nearly all the furnaces contracted at the beginning of the year for their requirements through the whole twelve months, instead of for only the first six, as has usually been the case. In foundry coke there has been considerable activity, and prices are quite firm. We quote standard Connellsville coke as follows: Furnace, $1.60; foundry, $2.30; crushed, $2.30.

CHICAGO.

OFFICE OF *The Iron Trade Review and Industrial World.*
1522 MONADNOCK BLOCK, March 15.

General conditions are very much as they were a week ago, with advancing prices on nearly every commodity. The demand for nearly every kind of iron and steel is larger than mills and furnaces can furnish, for short time delivery, and sales are limited only by this state of affairs. Business last week included considerable sales of most classes of material, with a large unsatisfied demand. Buyers are anxious to contract for a long time ahead, in many cases, but sellers are not willing, as a rule, to dispose of their product for more than the next four or five months, at the outside, and in some lines the time for deliveries much shorter.

PIG IRON.—Considerable sales of pig iron were made last

week, for both Northern and Southern furnaces. The largest order of the week was one of 6,000 tons, others being for 3,000, 2,000 and smaller lots. The demand for immediate delivery is not especially large, but many consumers are anxious to place their orders for delivery the last half of the year, and inquiries of this character foot up a very large tonnage. Usually the furnaces prefer not to sell for so long a time ahead, and have put off the buyers until later in the year. In some cases the pressure to buy has been so heavy as almost to force the furnaces to take the business. The market continues to rise, advances of 50 cents on Northern and $1 on Southern irons having been made in the week. Most producers appear to think the market is plenty high enough, and believe that further advances should not be made. The situation is entirely out of the hands of the furnaces, however, and no efforts to keep prices at any level could be successful with the buyers offering premiums to secure iron, as has been the case in several instances lately. Predictions are made freely the $20 iron is not far off; the prophets express the opinion, however, that if any such price is made, it will be followed by a decided reaction which may carry values lower than they are at present. But on such a market as this prophecy is entirely valueless. Quotations are revised as follows:

Lake Sup. Charcoal	$15 50@$16 50	Southern Coke No. 3	$14 75@15 00
Local Coke Fdy. No. 1	15 00@15 50	Southern No. 1 Soft	15 50@16 00
Local Coke Fdy. No. 2	14 50@15 00	Southern No. 2 Soft	15 00@15 50
Local Coke Fdy. No. 3	14 00@14 50	Southern Silveries	15 50@16 00
Local Scotch Fdy. No. 1	15 00@15 50	Jackson Co. Silveries	15 00@16 00
Local Scotch Fdy. No. 2	14 50@15 00	Ohio Strong Softeners	15 00@16 00
Local Scotch Fdy. No. 3	14 00@14 50	Alabama Car Wheel	17 50@18 00
Southern Coke No. 1	15 50@16 00	Malleable Bessemer	15 00@15 50
Southern Coke No. 2	15 00@15 50	Coke Bessemer	15 00@15 50

Bars.—The market is in a very unsettled state. The meeting of the Western bar makers in this city last week is said to have resulted in furthering arrangements for the practical consolidation of all the Western bar mills, although no information was given out or is obtainable regarding the actual proceedings of the meeting. There is no doubt, however, that strenous efforts are being made to combine the mills, and well informed men in the trade express the belief that they will be successful and that the combination will be effected within the next month or two. In the meantime, prices have advanced, and common iron is now quoted at 1.50c; sales were made last week at figures almost as high as this, and few if any mills will quote less than 1.50c this week. The demand is large, for both iron and steel, and good sales were made last week. The largest order was for 3,000 tons. Steel bars are quoted all the way from 1.50c to 1.75c, and some mills ask even higher prices than these.

Rails and Track Supplies.—Orders for about 6,000 tons of rails were closed last week, including both light and standard sections. The demand is good. Quotations are as follows: Standard section rails, $23 to $24; light rails, $21 and upwards; steel splice bars, 1.15c to 1.25c; track bolts with square nuts, 1.80c to 1.90c; hexagon nuts, 1.90c to 2c; spikes, 1.55c to 1.60c.

Car Orders.—The Pennsylvania system bought 1,000 cars last week, and other roads purchased an aggregate of 3,000 cars. Further business is in the market and will be let soon. The demand for car material of all kinds is large, and sales last week were of considerable size.

Billets and Rods.—The local mills refused orders last week for large lots of billets and rods, taking only a few of small orders. Prices are nominal at $27 for open-hearth billets, $24.50 for Bessemer billets, and $31 for rods.

Structural Material.—The largest order placed last week was for 3,700 tons of bridge material for work on the Northern Pacific Several other smaller contracts for bridge material were let, making a large aggregate. Three or four small building contracts were let, but no large orders of this class were taken. General business was large and was of excellent character. The demand for material of all kinds is increasing steadily. The market is higher. Quotations are as follows: Beams, 15 inch and under, 1.55c to 1.60c; 18 inch and over, 1.65c to 1.70c; angles, 1.50c to 1.60c; sheared plates, 2.10c to 2.20c; universal plates, 2.15c to 2.25c; tees, 1.55c to 1.60c; zees, 1.55c to 1.60c. Small lots from stock are quoted at ¼c to ½c higher.

Plates.—The demand has been much heavier than the mills could supply and this fact has limited sales to a considerable extent, although several good sized contracts were closed last week, both from mill and from store. Prices on plates range very wide, according to the ability of the mills to accept business. Quotations are as follows: Tank plates, 2.15c to 2.25c; flange steel, 2.25c to 2.40c; marine, 2.25c to 2.40c; fire box steel, 2.25c to 4c.

Sheets.—The demand for both black and galvanized sheets is heavy but buyers find considerable difficulty in getting mills to accept their business. Most mills are full of work for some time ahead, and are not willing to accept further orders for the present. Black sheets, No. 27, are quoted from 2.40c to 2.60c; galvanized sheets, 75 to 75 and 5 per cent off.

Merchant Steel.—Considerable sales were made last week, and the demand appears to be increasing all the time. Many mills refuse to accept all the business offered. Prices are considerably higher, as follows: Open-hearth spring, tire and machinery steel, 2c to 2.10c; smooth finished machinery steel, 2c to 2.05c; smooth finished tire steel, 1.75 to 1.80c; tool steel, 6c to 7.50c; specials, 10c and upwards.

Wire and Wire Nails.—Another advance has been made in wire and nails, this time of 15 cents. The demand for wire and nails is large, and sales have been of good volume. Prices are made as follows: Wire nails, $2.15; painted barb wire, $2.25; galvanized barb wire, $2.65; plain, $2; all at Joliet, in car lots; less than car lots are quoted 10 cents higher.

Scrap.—The demand for heavy scrap of the melting varieties is large, and buyers cannot always find sellers willing to enter their orders, or able to do so. Sales last week included one of 1,700 tons of old wheels; one of 600 tons of old wheels; one of 500 tons of heavy cast scrap, and several of smaller lots of cast scrap. Dealers' selling prices are as follows:

Old iron rails, gross	$15 75@$16 00	Axles, net	$17 00@$17 50
Old steel rails, long, gr.	10 75@11 00	Cast borings, net	4 75@5 00
Old steel rails, short	9 00@9 50	Wrought turnings, net	7 00@7 50
Old wheels, gross	15 25@15 75	Axle turnings, net	9 00@9 50
Railroad forge, net	14 00@14 25	Mixed steel, gross	8 00@8 25
Dealer's forge, net	11 50@12 00	Stove plates, net	8 00@8 50
No. 1 mill, net	9 50@10 00	Heavy melting steel, gr.	9 00@9 50
Heavy cast, net	10 50@11 00	Old iron splice b., net.	16 00@16 25
Malleable cast, net	8 00@9 00		

CLEVELAND.

Office of *The Iron Trade Review and Industrial World*, 27 Vincent St., March 15.

Some re-sales of ore by furnace men are noted. While the quantities are not large the advances in price are considerable, reaching 50 to 85 cents a ton in certain instances. The threatened strike of Ishpeming miners, referred to last week, has not yet materialized. The men appointed a committee of conference instead, and at a meeting Saturday night decided to remain at work for the present. These developments indicate that, as surmised, the form of the demand by the agitators was more intemperate and unreasonable than the majority of the miners sanctioned. Meanwhile, however, organizers are going into the Marquette district to strengthen the lines for an effort later. Sales of Lake Superior mining stocks of late have shown steady advances. Cleveland-Cliffs, Chandler and Lake Superior have been conspicuous in this regard, though in the case of the last named, transactions were stopped by the circulars from the company's officers. The second of these names $40 as the figures at which the officers would receive stock from holders, to be delivered under the option already given on a majority of the stock, but the name of the intending purchaser is not revealeed. It is expected that the deal will be definitely closed by April 1. In Cleveland-Cliffs stock $80 has been reached as against $40 in the latter part of 1898. Chandler, since its recent dividend, has gone to $60.

Pig Iron.—The meeting of the association of Bessemer pig iron producers in Cleveland last week decided on $13.50, valley, as the basis for any sales that might be made by furnacemen for delivery in the second quarter, but this figure is nominal. With billets at $24 and $24.50 furnaces having any metal to sell will not accept this price. Sales are reported in the past week, amounting to several thousand tons at $14, $14.50 and $15, valley furnace, for delivery in March, April, May and June. A meeting will be held the latter part of the week at which a basis may be fixed for sales for the third quarter of the year. Some of the buying of the past week has been for delivery to Pittsburg steel works. The market for foundry iron is stronger with every week. The slight addition to valley capacity available for second quarter has been promptly taken up, and still foundries here and there are seeking iron for shipment before the middle of the year.

(Continued on page 8.)

THE IRON TRADE REVIEW
AND
INDUSTRIAL WORLD.

DEVOTED TO MACHINERY, METAL-WORKING AND FOUNDRY TRADES AND IRON AND STEEL MANUFACTURE.

PUBLISHED EVERY THURSDAY BY
THE IRON TRADE REVIEW CO.,
CLEVELAND, OHIO.

CLEVELAND, 27 VINCENT STREET.
G. H GARDNER, President. A. I. FINDLEY, Editor.

CHICAGO:
1522 MONADNOCK BLOCK.
B. M. GARDNER, Associate Editor and Western Manager.

PITTSBURG:
705 PUBLICATION BUILDING.
B. E. V. LUTY, Manager.

BOSTON: 16 Herald Bldg. | NEW YORK: 203 Broadway.

Subscription (strictly in advance), $3 per annum. Advertising Rates Furnished on Application.

The Cleveland News Co. will supply the trade with THE IRON TRADE REVIEW through the regular channels of the American News Co.

ENTERED AT THE POST OFFICE AT CLEVELAND, O., AS SECOND CLASS MATTER

MARCH 16, 1899.

CONCILIATION IN THE FOUNDRY TRADE.

The conference in New York last week between committees from the National Founders' Association and the Iron Molders' Union of North America marks an important development, we believe, in the relations between foundry labor and foundry capital. The excellent state of feeling that has existed between the stove molders of the country and the Stove Founders' National Defense Association for the past eight or ten years has been cited frequently as the ideal condition. Year has followed year without an outbreak or interruption due to wage or other disputes, the whole range of questions that arise between employers and employes being covered by the annual conferences between the molders' and proprietors' organizations and the machinery provided for the settlement of differences by arbitration. It need scarcely be said that the element of selfishness has not been eliminated from the stove trade; nor that molders and founders engaged in that business are more just to each other than are labor and capital in machinery and jobbing foundries. But the two factors in the stove trade have been wise enough to agree that neither wants to fight the other; that strikes and lockouts and boycotting and blacklisting are wasteful and hurt, ful and ought to be banished. Having set out to misunderstand and to hurt each other, the two organizations at length saw the folly of strife, and ever since there has been respect by each for the other's strength, and the willingness to go half way in conciliation.

We are glad to note that the National Founders' Association, which takes in representatively the general foundry trade of the country, has followed the stove founders in this prime object of its existence. When the American Foundrymen's Association was organized in Philadelphia three years ago, there were a few sanguine spirits who saw the possibilities of something more than an association for technical advancement and improvement of practice. They pointed to the utter demoralization which had come over the business through unfair and senselses competition, and urged some step toward a price agreement. They said frankly that some practical outcome of this sort was all that could commend the association idea to them in any form. It quickly appeared that in the then existing lack of acquaintance and confidence among foundrymen, any such movement was out of the question. But the association idea, with its educational and information features, carried. Though not designed to go further, it opened the way directly for the defense movement. And the latter, while primarily for the avoidance of labor troubles by organizing a force sufficient to inspire respect, is bound to exert an influence on prices. For, given an approximation to uniformity in wage conditions, and the chances for important variations in selling prices have been narrowed greatly. And the cutting of wages so that a contract in distant territory may be captured right under the eyes of a competitor paying labor fairly, is at an end.

It has been found in the brief history of the National Founders' Association that the possibilities of improving the foundry trade through an approach to uniformity in wage conditions are greater than many prominent in it have been willing to concede. Confidence between foundry firms is one essential that is now more in evidence. This gained, the enlargement of the sentiment so that the happy condition existing between proprietors and men in the stove trade may be attained, is not far off. The meeting in New York last week may be regarded as marking an epoch in the history of the general foundry trade. It is a long step in advance, to have proprietors and men agree that there shall be no lock-outs or strikes pending adjustments of disputes; and that both sides shall attempt, quickly and justly to come to a basis of settlement, each side counseling with officials of its own organization, and the latter seeking by conference to give an unbiased judgment on the matters at issue.

It is fortunate that this movement has taken shape while the trade is coming into a measure of prosperity. Incursions into distant territory to take contracts will be far fewer, and wages can be more nearly maintained on a parity. A year or more of operation under such conditions will strengthen mutual faith and prepare for the tests that will come when conditions are less favorable.

ESTIMATING MACHINE SHOP PROFITS.

A friend of mine had a surprise last year. Two years ago he was engaged to take charge of the manufacturing end of a machinery business, and this machinery business was of such a nature that it had always been necessary to keep on hand a large stock of finished parts to draw on when assembling the machines. My friend sailed in and made excellent progress, reducing by a large percentage the cost of manufacturing finished parts. He knew more about manufacturing than he did about taking inventory, or taking stock, or whatever you choose to call it. (It is a mean enough job, anyhow, whatever it is called.)

When the inventory was figured up a year ago the books showed a loss, although my friend knew that he had reduced the cost of manufacturing; and he was therefore paralyzed with astonishment and began to look up the matter of inventories, with which he had never before had anything to do.

He found that it had always been customary to estimate the stock of finished parts at cost; and the custom having been followed in this case, the saving in manufacturing which he had made actually went to his discredit, as far as the books could show. He felt a little better when he found this out, but the average stockholder being an ass, so to speak, he had to use all his eloquence to keep from getting his passports; and not being an expert in the matter of eloquence, either, the whole matter was a rather trying experience.

It was decided to give him another chance; and now this year, the inventory being finished, the books show a good profit. It simply comes to this: the profit which was really made year before last does not show on the books till this year, simply because the finished parts always go at cost.

It therefore follows that a new man could actually have his cost of manufacturing increased, and yet have the books show a large profit for that year, unless some better way than putting these things in at cost can be used. And it follows, further, that it cannot be told in any one year how the business is really going, but must be decided by the results of a series of years—that is, unless some better way of taking stock can be invented.

For all I know there may be some better way, and if there is my friend would like to hear of it, as he does not want to have any such fright again.

SCRUTATOR.

A SOUTHERN publication that neither studies nor knows the iron market and that considers dogmatic assertion a good cover for ignorance, has been kind enough to settle the whole situation in one fell utterance. Commenting on *The Iron Trade Review's* statements of facts concerning the market, the Souhern oracle, perched some hundreds of miles from any market in which Bessemer pig iron is sold, gravely tells us that recent sales of $12 Bessemer "are parts of a rather scattered and not very important 'flurry,' not important at least as indicating anything in particular about the last half of the year's iron business." Then with all the confidence of one who doesn't know, it adds: "The bottom will drop out of these quotations as sure as we live to see the first of May." Probably not knowing that a life was at stake, the iron trade has gone on its way; and not only has the $12 Bessemer iron price been maintained, but sales have been made up to $14.50. Moreover, the price for the second half of the year, which will be announced within a few days and at which business will be done promptly, will be close to $14. Perhaps this matter should have been postponed until the vast Bessemer furnace interests of Tennessee could be consulted, but Pittsburg and the valleys have been irrepressible in the idea that they should have something to say.

THE Lewisburg Rolling Mill, at Lewisburg, Pa., will probably be dismantled and sold to scrap dealers in the near future.

INDUSTRIAL BRIEFS.

The Altoona Iron Co. has given puddlers 25 per cent advance and other workmen 10 per cent.

The Ivanhoe Furnace of the New River Mineral Co., Ivanhoe Furnace, Va., was blown out on Feb. 17.

One Ashland Furnace, at Ashland, Ky., has been blown out for repairs.

The Middletown, Ind., plant of the American Tin Plate Co., is being removed to Elwood, Ind., for consolidation with the large plant there.

The Dillon-Griswold Wire Co., of Sterling, Ill., is erecting a wire rod train, which it expects to have completed about the middle of April. It will have an annual capacity of from 45,000 to 50,000 tons of rods.

The Kelly Nail & Iron Co., of Ironton, O., has installed 50 machines in its new wire nail plant, with an annual capacity of 600,000 kegs.

The plant of the American Nut & Bolt Co., at Newport, Ky., is idle and for sale. The plant is equipped with five single puddling furnaces, five heating furnaces, two scrap furnaces, and four trains of rolls. Its specialties are bar, roofing, and stove-pipe iron, bridge rods, bolts and nuts, and coach screws.

The Wright Shovel Co. has not rebuilt its works at Greenfield, Ind., destroyed by fire last fall. The company has purchased the plant of the Akron Steam Forge Co., at Elwood, Ind., and equipped it with the rolling mill machinery from the Greenneld plant. Operations commenced on Feb. 1. The company will produce plates at these works for use in its shovel plant. It also operates a rolling mill at Anderson, Ind., which also produces shovel plates.

W. S. Rockwell & Co., New York, have recently erected one of their improved oil annealing furnaces for the Scovill Mfg. Co., Waterbury, Conn. They report a steady demand for their furnaces.

The Reese-Hammond Fire Brick Co., Bolivar, Pa., is running its four plants to their full capacity and have voluntarily granted its men an advance in wages, varying from 5 to 20 per cent, taking effect April 1. This will affect about 250 employes. The company is building new kilns and increasing the capacity of its No. 4 plant, which was built last year. The original intention was that this plant should be increased to a daily capacity of 100,000 brick. The company will not be able to reach that this year, but is adding to it with that idea in view. The advance in wages is due principally to the fact that the price on coke oven brick, and some furnace brick has been advanced $2 to $3 a thousand.

Charles S. Prizer resigned on March 2 as president of the Reading Stove Works, Reading, Pa., an office he had held since 1892, and became president and general manager of the Prizer & Painter Co., of Reading, a company he has recently formed. Mr. Prizer has associated with him in this company Enoch T. Painter, Ralph L. McCall and Alexander T. Henderson, who have been respectively superintendent, treasurer and heating engineer of the Reading Stove Works. They have a well equipped foundry plant in that section of Reading known as Milmont, the present capacity of which is 75 molders, but it can be enlarged to the capacity of 200 molders.

The Weimer Machine Works Co., of Lebanon, Pa., has an order from the blast furnaces at Esch bei Alzette, Germany, for five patent liquid cinder cars of 200 cubic feet capacity. The Spearman Iron Co., of Sharpsville, Pa., has ordered a 50x96x60 inch Weimer blowing engine. It is reported that the Riverside Iron Works, of Wheeling, are having plans made for a modern 500-ton blast furnace, which will be built adjoining the present blast furnace and coke plant sites at Benwood, W. Va. A large plat of ground on the Ohio river was recently purchased. When this furnace is built it is probable the one at Steubenville will be abandoned.

The plant of the Punch, Shear & Roll Co., Cambridge City, Ind., was bought in at sheriff's sale by John R. Bond. The works will be put in operation at an early date.

W. S. Rockwell & Co., New York, have recently built one of their improved oil furnaces for annealing copper wire for the American Electrical Works, Providence, R. I.

After being idle for three years, it is announced that the Poughkeepsie Iron Co.'s furnace at Poughkeepsie, N. Y., will start up again, as soon as it can be put in order.

CLEVELAND MARKET.—Continued from page 5.

Sales have been at $13.50 to $14 for No. 2, and $14 and $14.50 for No. 1, at valley furnaces. Gray forge is on a basis of $13, valley furnace, and mills will evidently not be able to get material sufficient, either in iron or scrap, to cover their sales for the next four months. The Lake Superior charcoal iron market is practically at a standstill, all the furnaces being sold up for months. We quote as follows, all Cleveland delivery, with the exception noted:

Bessemer	$14 65	Valley Scotch No. 1	$14 90@15 15
No. 1 Strong Foundry	14 65@15 15	Valley Scotch No. 2	14 40@14 65
No. 2 Strong Foundry	14 15@14 65	Gray Forge, valley	13 00@13 50
No. 3 Foundry	13 75@14 00	Lake Superior Charcoal	15 00@16 00

FINISHED MATERIAL.—Local representatives of Pittsburg steel works have little material to sell, apart from shapes, specifications on which, with some little new business, come along steadily. Bars are nearly as difficult to get as plates, and Pitssburg bar mills are now quoting from 1.40c to 1.60c, where anything can be taken on in the next four or five months. Bar iron is now fairly 1.40c at valley, or Cleveland mill, and there are signs that mills are oversold for the first half of the year, so that relatively little tonnage will go out at the current price. The basis of the second half of the year, is a matter for the future to decide. The project to combine Western rolling mills is a factor of some importance; but even though it should fail, the position of the iron manufacturers is stronger than at any time since 1892 and every pound of product will be wanted at a good price. Sheets have scored their weekly advance of about $2 a ton, and No. 27 are now quoted at 2.70c by Cleveland jobbers, with 2.50c to 2.60c the basis of the Pittsburg mill shipments. The price has no effect to cut off business. Buyers of plates are beginning to get prices for the latter part of the year, and are being quoted 2c for delivery in August and later; but neither side seems entirely sure of its ground on this basis and a little is done as yet. The activity of wire rod, wire and nail mills in the Cleveland district continues at an unparalleled rate. An advance on all products has been made in the week, so that quotations at Cleveland mill, in carload lots are now as follows: Wire nails, $2; smooth wire, $1.85 base, painted wire, $2.25; barb wire, painted $2.10; galvanized, $2.50.

OLD MATERIAL.—Prices vary considerably, sales being more of a matter of what buyer and seller can come together upon, with sellers quite independent and some of them disposed to hold for further advances. The movement is not large and the market is difficult to quote. We quote old iron rails at $17 to $17.50, valley; old steel rails, $12; old car wheels, $13.50 to $14.50, Cleveland, all gross tons. No. 1 railroad scrap is quoted at $14 to $16; No. 1 machinery scrap, $12 to $13; iron axles, $17 to $18; wrought turnings, $9; cast borings, $7.50 to $8; grate bars, $7.50, net tons.

CINCINNATI.

March 14.

In their review of the pig iron market, Matthew, Addy & Co. say this week: In discussing the market it is hard to know where to begin. Perhaps the quickest and shortest way is to say that we have now reached a point where buyers are accepting every offer that is made and an advance from day to day apparently is the normal condition. No. 2 foundry has been sold at $12, Birmingham. Sellers are anxious to withdraw entirely from the market, but buyers apparently are in a panic and will not permit this. They are pushing for offers, and when an offer is made so much higher than the last reported sales that the seller thinks it will end the transaction the buyer promptly accepts. That is the history of most of the sales that were made last week, and the aggregate tonnage of last week's transactions is very large. There is more and more trouble in regard to quick shipments. Consumers are not getting their iron on contract time. Practically every furnace in the South and in Ohio is behind hand on shipping specifications. This evidence that furnaces are oversold is one of the things that so powerfully stimulates buyers to remain in the market until they can cover their requirements. Practically the orders that are being taken are for delivery from July to December, although one or two buyers have asked for deliveries into next year. The buyers have put the market up on themselves and their panic in regard to the situation promises to send prices still higher."

Rogers, Brown & Co., referring to last week's market, say that it greatly emphasized the excited condition noted in the preceding week. They find that quoted figures which at first startle buyers are afterwards quickly accepted when they know the real situation. We quote Southern coke, No. 1 foundry, $14.00 to $14.25; No. 2, $13.75 to $14.00; No. 3, $13.25 to $13.50; No. 4 and gray forge, $12.75 to $13.00; mottled, $12.75 to $13.00; No. 1 soft, $14.00 to $14.25; No. 2 soft, $13.75 to $14.00; Lake Superior coke, No. 1, $14.50 to $15.00; Lake Superior coke No. 2, $14.25 to $14.50; Hanging Rock charcoal No. 1, $16.50 to $18; Jackson Co. silvery No. 1, $15.00 to $15.50; Standard Georgia car wheel, $15.50 to $16.00; Hinkle Lake Superior charcoal, $15.75 to $16.00.

Personal.

J. H. King, of the King, Gilbert & Warner Co., has gone to Mexico, where he has business interests. R. M. Gilbert goes to Chicago to reside. T. J. Gilbert, treasurer of the King, Gilbert & Warner Co., has removed to Ironton, O., to become secretary and treasurer of the Marting Iron Co.

Benj. H. Taylor has resigned as chief of the mechanical engineering department of the Edgar Thomson Steel Works, which he has filled for the last seven years, and has become general manager of the Coal Bluff Coal Co.'s coke ovens and coal mines at Coal Bluff.

Wm. T. Manning, whose invention of a new sectional T-rail for use on curves was referred to in these columns about a month ago, has, at his own request, been relieved of his duties as chief engineer of the Baltimore & Ohio railroad, at Baltimore, though remaining in the service as consulting engineer. He is succeeded by Major P. R. Lewis.

E. P. Bullard, president of the E. P. Bullard Machine Tool Co., Bridgeport, Conn., returned Feb. 28 from a five months' trip to Europe, in which he visited the chief manufacturing establishments of Great Britain and Continental Europe, going to Vienna, St. Petersburg, Berlin and Paris. He spent considerable time among English manufacturers.

President Baush, of the Baush & Harris Machine Tool Works, Springfield, Mass., has returned from a brief visit abroad. He spent most of his time among English machine shops.

Wm. Garrett, of the Garrett-Cromwell Engineering Co., who has been in Europe in the past two months, sails for home, March 18.

Prsident A. J. Moxham, of the Lorain Steel Co., Lorain O., gave a dinner at the Union Club, Cleveland, on March 8, to introduce to some of his friends Pierre du Pont, who succeeds Mr. Moxham in the presidency of the Johnson Co., the original company, which still controls certain interests. Mr. Moxham sails for England on March 22 and his absence will be for about two years. From England he will go on a yachting cruise that will include the West Indies.

Possibility of Tin Plate Imports.

The scarcity of tin plates was noted in these columns last week. Since then this scarcity has become more pronounced, and would-be purchasers are scouring the country in the effort to secure what they can from dealers, but stocks are so low that little is secured. The price is all of $4.00 at mill for 100-lb. cokes, made so by the bidding of consumers, the American Tin Plate Co. not having entered the market again, and selling only in cases where it happens to have the desired size in stock. Its Eastern selling agent is even quoted as saying that the importation of foreign plates is "quite possible." The company has been unable so far to catch up with specifications.

The latest quotations in Wales are 11s. 9d. to 12s. 6d., f. o. b. dock at Swansea, for 108-lb Bessemer coke plates. The lower of these quotations would be $2.85. It is subject to discounts of 3 and 1 per cent for cash, and a brokerage commission of 2 per cent should be added, which includes inspection before shipment, etc., reducing the price roughly by 2 per cent, or to $2.79. The ocean freight and insurance amounts to at least 15 cents a box, while the duty at 1½ cents a pound is $1.62, making the cost, duty paid, on dock at New York, $4 56. It is claimed, however, that for export purposes the Welsh makers will make closer quotations than those given above.

THE CONSOLIDATIONS.

American Steel and Wire Co.

Following the acquisition of the Schoenberger Steel Co.'s plants at Pittsburg, the American Steel & Wire Co. is reported to be negotiating for the interests which are repesented in the rod mill at Ashland, Ky., recently completed by the Ashland Steel Co. This mill was erected by the kindred interests—the Belfont Iron Works Co, with its nail plant and blast furnace at Ironton; the Kelly Nail & Iron Co, with its nail mill, puddling furnaces and muck bar mill; the Ashland Steel Co, with two 5½-gross-ton converters, blooming and billet mill and rod mill and wire-drawing plant, and the Ashland Furnaces of the Ashland Coal & Iron Railway Co., which supply the steel plant with pig iron. Two furnaces are owned by the latter company and a third is leased from the Norton Iron Works.

The American Steel & Wire Co.'s directors have declared a first dividend of 1¼ per cent for the quarter on the preferred stock, payable April 15.

National Steel Co.

The National Steel Co., has closed an option on the Thomas Furnace at Niles, O., and will take possession April 1. The stack is 75x17 feet, and produces about 300 tons a day. The product will be shipped to the Ohio Steel Co.'s plant. W. A. Thomas will continue as superintendent of the furnace. An option has been taken also, it is reported, on the 77x19 ft. stack of the Brier Hill Iron & Coal Co., making Bssemer and low-phosphorus irons. The Ohio Steel Co. has taken the Bessemer product of this furnace for some time.

It is stated that Thomas McDonald, general superintendent of the Ohio Steel Co., from the time of its organization, will be made general manager of all plants of the National Steel Co., and will be succeeded by Thomas Parrock, at present superintendent of the Union Iron & Steel Co. Mr. McDonald went to Youngstown from Braddock, Pa., where he was connected with the Carnegie Steel Co., Ltd.

Steam Pump Manufacturers.

A consolidation of six of the prominent steam pump manufacturing companies, is the latest of the amalgamations of particular interest to the iron and machinery trades. Until the past week Henry R. Worthington, the largest manufacturer of pumping machinery in the country, has been indifferent to the plans for amalgamation, but his co-operation is now assured. The six concerns upon whose properties options have been secured are: Henry R. Worthington, of Brooklyn, N. Y., Blake & Knowles, of New York and Boston; Deane Steam Pump Co., of Holyoke, Mass.; Snow Steam Pump Co., of Buffalo, N. Y.; Laidlaw-Dunn-Gordon Co., of Cincinnati, and the Holly Manufacturing Co., of Lockport, N. Y. The capitalization proposed is $27,500,000, and this may be increased in view of the fact that two other Central Western companies, one of which is in Cincinnati, will yet be taken in. The outside capital that may come in will not be a large factor, it is stated, a majority of the stock being in the hands of the constituent companies. The underwiting of the enterprise is in the hands of Kuhn, Loeb & Co., and P. Lehman, of New York. The advanatges urged for the consolidation are the usual ones—the saving of clerical and selling expenses and concentration of management. It is said that prices would not be advanced, since that would invite competition, but it is agreed that a combination of forces would hold prices to a profitable level.

United States Cast Iron Pipe & Foundry Co.

The United States Cast Iron Pipe & Foundry Co., will formally assume the direction and control of the constituent plants this week. The stock of the company has been largely subscribed by the manufacturers, and the outside subscriptions are principally in large amounts by conservative investors. The following will constitute the board of directors: Gen. Samuel Thomas, New York; Colgate Hoyt, New York; A. C. Overholt, and W. C. Overholt, from the National Foundry & Pipe Works, Scottdale, Pa.; A. K. McNeal Pipe & Foundry Co., Burlington, N. J.; George B. Hayes, from the Buffalo Cast Iron Pipe Foundry, Buffalo; C. E. Burke, from the Lake Shore Foundry, Cleveland; E. C. Fuller, from the Ohio Pipe Co., Columbus; W. C. Proctor, and B. F. Haughton, from the Addyston Pipe & Steel Co., Cincinnati; George J. Long, and A. F. Callahan, from Dennis Long & Co., Louisville, Ky.; F. C. Miller, from the American Pipe & Foundry Co., Chattanooga, Tenn. In addition to the plants named in the prospectus, the company has acquired the plant at West Superior, Wis. Of the thirteen directors it will be seen that eleven have been selected among the constituent companies. Mr. Hoyt will represent on the board the Rockefeller interest in the West Superior plant. Gen. Samuel Thomas will probably be president. The headquarters will be in New York.

NATIONAL FOUNDERS' ASSOCIATION

The first annual meeting of the National Founders' Association, held at Buffalo in February, developed a healthy growth of the organization, and gave ample promise that it is to be an increasingly important factor in the great foundry industry. There have been steady additions to the membership, which now includes some of the largest and best conducted establishments in the country. In his report to the Buffalo meeting Secretary Penton noted the activity in increasing the ranks of trades unions connected with foundry operations, and this fact will exert its influence in furthering organisation among proprietors.

President P. W. Gates, of Chicago, in his annual report emphasized the purpose of the association to deal fairly with employes in all disputes settled by its officers. In one noteworthy instance, last year the decision was in favor of the men. Mr. Gates said: "The two cases settled by your Fourth District committee have leavened the minds of the employes with the belief that this association is not intended to oppress labor, but to recognize its just claims, and as to these are added other just decrees, the entire labor element with which this association comes in contact, will willingly accept its advice in solving difficulties, and the resort to strikes be largely if not wholly eliminated. If, however, it becomes necessary to resort to extreme measures, your district committee and your officers should have your loyal support. Insisting at all times that the actions of your officers shall be in strict equity and justice, encourage and advise them by letter and otherwise, and through proper channels at proper times and places, let it be known that you have every confidence in the association and its officers and will stand by it until it wins."

After touching on the method by which the association settles differences between members and their employes the report says: "In any event, it should be the policy to persuade the men to remain at work until such time as your disrict committees have made their final decision and the same has been accepted or rejected. If rejcted, we think it should be the policy of our members (other things being equal) to retain the services of such men as take the place of strikers even to insisting that they be allowed to join the union (if so they desire) in case union help is re-employed. When men are wanted to take the place of strikers, much assistance can b rendered if each member will take it upon himself to offer the secretary the services of any volunteers whom his firm may secure in their own establishment, or of those applying for work who are willing to go to such a position."

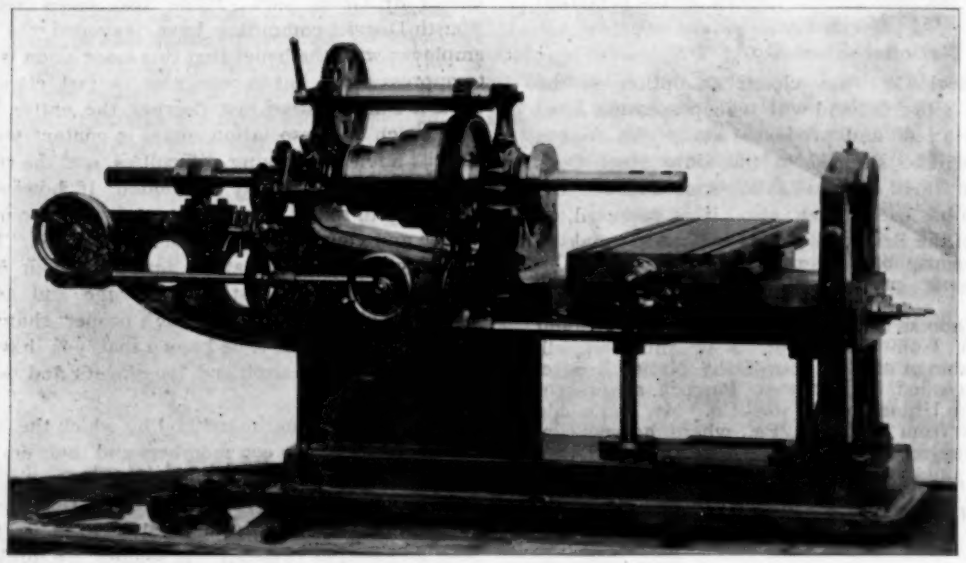
The next important proceeding of the meeting, and one that is calculated to be of far-reaching import, was the appointment of a committee to meet a similar committee of the Iron Molders' Union of North America—the conference to consider the advisability of recommending to the two organizations a practical scheme for the arbitration of trade disputes. This was in response to a communication from President Martin Fox, of the molders' union. The committee named consisted of G. E. Emmons, General Electric Co., Schenectady, N. Y.; A. J. Caldwell, Henry R. Worthington, Brooklyn, N. Y.; L. E. Bellows, Deane Steam Pump Co., Holyoke, Mass.; Edward Maher, Maher & Flockhart, Newark, N. J.; Frank Patterson, O. P. Letchworth, Pratt & Letchworth Co., Buffalo.

The officers of the association for this year are the following: President, O. P. Letchworth, Buffalo; vice-president, H. M. Leland, Detroit; treasurer, W. H Wells, Lockport, N. Y.; secretary, John A. Penton, Detroit.

The conference between the committee of the molders' union and of the founders' association was held at Murray Hill Hotel, New York, last week. A basis for an arbitration scheme was agreed to and will be presented for ratification to the organizations. In the case of the National Founders' Association, the report of the committee is presented to the administrative council. The outcome is most important, in that it insures a basis of relations between the manufacturers and the molders similar to that now existing between the Stove Founders' National Defense Association and the union stove molders. Among other provisions is one that in all cases of complaint by employes, the latter shall continue at work, pending the adjustment of the dispute by the proper representatives of the two bodies. Another is that no discrimination shall be made by molders against any patterns or work that may be brought into the shop in which they are employed, this being designed to eliminate sympathy strikes and all the complications that have flowed from them.

BORING AND MILLING MACHINE.

A horizontal boring machine of the type manufactured by the Newark Machine Tool Works, modified so that it can be employed for milling as well as boring, is shown in the illustration. The changes for the additional service include the provision of a suitable carriage with power cross-feed and the other details peculiar to all milling machines. The machine, with this adaptation, can be kept busy, boring and milling alternately, where there is not sufficient of either class of work, taken separately, to pay for its installation. Wherever there are surfaces to be faced square, with the hole to be bored, it is found profitable, besides insuring accuracy, to finish these faces without resetting the piece. This can be accomplished by a combination machine. The advantages of



HORIZONTAL BORING AND MILLING MACHINE.

the horizontal boring machine are the facilities for setting the work accurately and for handling the boring bar quickly and the concentration of the power upon the cutting tool. The work is bolted to the carriage, directly under the boring bar, being set square by the top surface and the edges of the carriage, which are true with regard to the bar. The carriage can be moved either across or along the table, which is supported by two large screws. The table can be lowered or raised from the side or at the end.

For end or butt milling the cutter is fastened to the spindle face-plate, using a suitable fixture. Face and side mills are carried either on the boring bar or on arbors inserted in the end of the bar, which is steadied by the yoke at the outer end. The carriage is 50 inches long, by 20 inches wide, with 4 tee slots, 13-16ths wide and can be lowered 19½ inches from the center of the spindle. The feed of the carriage is 36 inches and changes of feed are obtained by suitable feed gearign. Adjustable dials aid the accurate reading of the vertical and cross movements. The table is 48 inches long and measures 39 inches between the inner faces of the yoke and inside face-plate. Two bushes are in the yoke, one fixed and one revolving with the bar to present wear on the end of the bar. The facing head is split and can be bolted either to the face plate or to the bar. The length over all is 10 feet, and the net weight about 7,000 pounds.

Blast Furnace Gas Engines.

TO THE EDITOR:

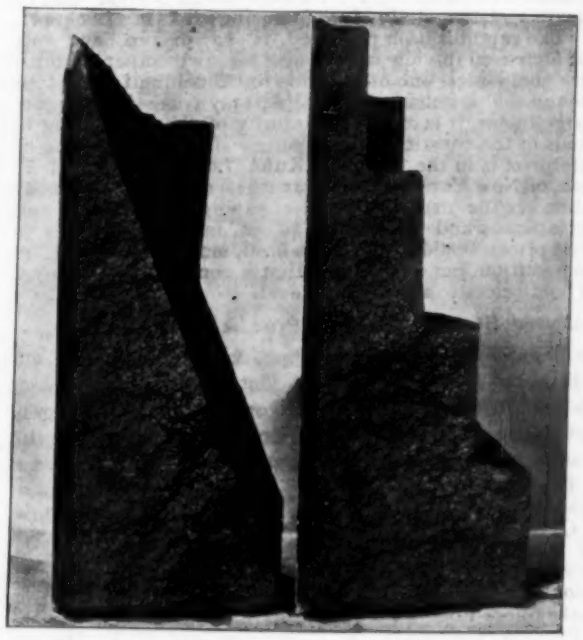
Referring to the article in your issue of March 2, page 11, regarding gas engines using furnace gas at the Cockerill works at Seraing, Belgium, I will say that it was not the intention in my communication of Feb. 16, to question Mr. Cremer's statements, but to offer information that might be of value as bearing on this most important subject; and I am surprised to learn that the Cockerill management have been able to get the new engines ready so early, and that they are now at work. I have watched carefully for news regarding this matter but have seen nothing in the British or Continental engineering journals, and it must appear that the Cockerill management has not been disposed to give the same publicity to its extended use of gas power as it did to the initial experiments. It would have been most interesting had Mr. Cremer gone into details and given particulars. There are other installations similar to that of the Cockerill works, either under way or in contemplation in Europe, and it looks as though it might be accepted as the coming standard practice there before we in the United States get around to look at the matter in a serious way.

A. BEMENT.

Chicago, March 13, 1899.

CHILLED FRACTURE OF INGOT MOLD IRON.

The accompanying cut shows the chilled fracture of the ingot mold iron for which tables of tests were given in our last issue—the results of the work of the testing committee of the American Foundrymen's Association. The composition of the cast from which the 192 bars tested were obtained, was as follows—as shown in the analysis of the 1-inch dry



sand square bar. Total carbon, 3.87 per cent; graphite, 3.44; silicon, 1.07; manganese, .29; phosphorus, .095; sulphur, .032.

IT is reported that A. W. Watts, who held a mortgage on the plant of the Watts Steel & Iron syndicate, Middlesborough, Ky., for $750,000, has cancelled it and taken that amount of stock in a new company, and that new capital to the amount of $250,000 will be put into the company by New York parties. The plant will be remodeled.

Review of the Technical Press.

[Translation, Condensation and Comment expressly for The Iron Trade Review by Dr. Richard Moldenke.]

Standard Specifications for Steel. [*Engineering Magazine*, March.]—Mr. William R. Webster, the well known engineer and active worker in the International Society for Testing Materials, discusses the question of establishing standards for the judging of steel products. In the gradual change from iron to steel, engineers generally realizing that they were having more and more to do with material a uniform in its apparent physical structure and to a greater degree amenable to scientific testing, as a consequence insisted upon a rigid performance of duties undertaken as per specifications. This meant careful and improving methods of production and manufacture. Thus it was found that steels of the same chemical composition could differ widely in their properties as they were rolled or hammered to a greater or less extent, and again the finishing temperature was a source of much uncertainty in results. Even to-day it is no easy matter to hold the producer up to certain requirements in physical quality, the modern continuous processes making it very difficult to hold the heat sufficiently long for the result desired, without beginning with over-heated material. Nevertheless the close study of chemical, heat and physical characteristics have enabled the American steel maker to stand unrivalled as such in the world's markets. It is quite common to cast a heat made with a given carbon contents kept within .02 per cent, have the ingots rolled out and finish the product without making a single preliminary test, the desired results being obtained every time. The method followed generally is to have the analysis ready before the ingots have left the soaking pit, and from the esitmated tensile strength corresponding to this analysis make use of the billets to get out the work for which they are suitable. If then afterwards the tests of the finished material do not come up to anticipation, irregularities in making may be suspected and proper precautionary methods adopted. The temperature conditions of steel processes cannot be watched too closely, for good material can be ruined easily by neglect in this direction. Yet with all this knowledge and with the means of accurate measurement at hand in the shape of modern pyrometers, the works rolling or forging steel that have them are few and far between. The eye is still relied upon, with plenty of chances for disaster not known in the office and carefully covered up in the works. When consumers of steel get to know enough on this point to warrant definite clauses in their specifications, a great step foward will have been taken. Mr. Webster discusses basic versus acid open-hearth steel, showing that the objections made to the former on account of the danger due to rephosphorization from the slag can be overcome by using low phosphorus stock in the first place. The great danger is to be found in the ultimate oxidation of the iron if left without carbon when using irons too high in phosphorus. Mr. Webster quotes the article by Mr. C. E. Stromeyer, on "Basic Refined Steel" (a review of which will be found in *The Iron Trade Review* of July 7, 1898), to bear out his statement that American basic steel, as also some of the continental products, are vastly superior to the ordinary high phosphorus basic steels of England. American specifications for steel are, as a rule, satisfactory to both producer and consumer. When, however, the steel is for export, the trouble begins, and this is really only due to minor variations in customs or practice. Hence Mr. Webster argues there is need of an international agreement on the subject which has latitude enough to reconcile all the peculiarities in methods now in vogue. Thus a standard testing speed should be established, the relation between thicknesses and width of the specimen determined, etc. A simple impact machine is also needed. A standard specification for 60-lb. Bessemer rails and accessories now follows, which is certainly complete if anything, and is calculated to ensure good material without delaying the mill producing it. The importance of a chemical specification is dwelt upon the Bessemer phosphorus limit of .10 being deemed amply safe. While there are wide differences of opinion upon the subject of proper chemical specifications for steel rails, in the end Mr. Webster thinks that the ones adopted will be fixed compositions for the different weights, which with proper finishing temperatures will make the toughest, softest and best wearing rails. In conclusion, a strong plea is presented urging manufacturers and engineers to unite in giving information which will enable the International Society to reconcile the existing conflicts and troubles with specifications, by drawing up an international agreement suitable to all.

Deterioration of Steel Rails.—*Engineering Magazine*, March, in an interesting editorial, reviews the work of Mr. Kirkaldy on the wear of steel rails, and that of Sir William Roberts-Austen on their microphotography. It was found that the breakage of some rails could be traced to the action of the rolling loads, and upon this a series of investigations were undertaken which showed that, contrary to the general belief, the deterioration was confined to the top of the rail entirely. It seemed to come from a mechanical hardening of the surface under the action of the rolling load. This naturally tends to the formation of cracks, which gradually open and result in ultimate failure. The action of the brakes, which cause skidding of the wheels, etc., is especially hard upon the rails, and much is learned by observing specimens the history of which is known. This class of troubles is distinct from those due to the constitution of the rail itself. Here the microstructure furnishes a clew to the difficulty, the use of an infusion of licorice when treating a highly polished section of the steel bringing out the ingredients in strong contrast. A normal rail should show a closely interlocked structure of its component parts; large polygonal crystals show that the temperature was too high. A careful series of experiments is recommended, the results of which will doubtless be very valuable in aiding the manufacturer and consumer alike in increasing the efficiency and safety of the permanent way.

Iron Alloys.—*Engineering*, Feb. 17, has the fifth report to the "Alloys Research Committee," by Sir William Roberts-Austen, from which the following items bearing upon iron are selected: The behavior of carborized iron, that is, steel and cast iron, was carefully studied with a view of bringing it into line with ordinary solutions, and indeed a striking analogy was found in the behavior of steel when compared with a salt solution. There is, however, a great complexity met with when steel and iron is studied, which makes the reaching of simple conclusions a difficult one. In obtaining the cooling curves of pure iron, a thermo-junction protruding from a glass tube was covered by electro-deposited iron of the purest character; the weight of this button was about 80 grains. This button was placed in a porcelain tube, the whole connected with a vacuum pump and then heated up to 2,400 degrees F., the evolved hydrogen being removed continuously. Upon cooling this iron the recorded curve obtained by the galvanometer showed five points at which heat was evolved, one at 1,640 degrees F. being very sudden and strong. These points, three of which are new are important, and taken in connection with other researches described later on, throw a new light upon a phase in steel hitherto little noticed. It is found that repeated heating of the same iron in vacuo renders these points more and more indistinct, thus showing that they are due in the first place to the presence of occluded hydrogen, which is gradually removed by the mercurial pump. Prof. Roberts-Austen states that the relation of this occluded hydrogen to the iron is even more complicated than is suspected, and that he has a number of studies in hand which he hopes soon to publish. A brief summary of the knowledge of iron and hydrogen is given which will not come amiss. Hydrogen is known to penetrate tubes of iron at red heat freely, and in cooling from redness in an absorption of hydrogen about .46 of its volume is occluded. Electrically deposited iron contained .028 per cent hydrogen, and in pickling iron with dilute sulphuric or hydrochloric acid similar results are observed. In Bessemerizing, though vast quantities of air containing little water is blown through the metal, more hydrogen is retained proportionately than either nitrogen or carbonic oxide. Even pig iron will persistently occlude it. An interesting point is noted in the fact that the amount of argon and its effect in passing through the converter is still to be noted. In studying the behavior of carbon iron solutions it was necessary to obtain a comparative set of samples in which only the amount of carbon was progressive. This was done by ladling out

enough steel from a large heat at regular intervals and casting ingots. Twenty-five samples were thus cast at 30 minute intervals, the carbon running from 1.80 down to .078. During this heat the sulphur remained constant at about .033, phosphorus ran from .054 down to .007, manganese from .391 to .217, there being only traces of silicon and arsenic present throughout the heat. As a fluid mass of steel cools it solidifies, this point being about 2,900 degrees F. as far as is now known. The steel is still very plastic, and can dissolve carbon, the amounts being 1.5 per cent at 1,800 degrees F. and 0.85 at 1,000 degrees F., depending upon the shape of the carbon, the combined form being much more readily soluble than graphite. This is the reason why pig iron which has been slowly cooled contains less carbon combined than steel. It is to be supposed that this means gray pig iron. The report is richly illustrated by photo-micrographs and a very exhaustive discussion of the delicate changes in structure incident to heat and carbon variations.

CONDITION OF BLAST FURNACES OF U. S.*

March 1, 1899.

Location of Furnaces.	Coke and Anthracite					Charcoal.				
	Total No. of Stacks.	In Blast.		Out of Blast.		Total No. of Stacks.	In Blast.		Out of Blast.	
		Number.	Weekly capacity.	Number.	Weekly capacity.		Number.	Weekly capacity	Number.	Weekly capacity.
New York	11	3	4206	8	6164	2	2	190	0	0
New Jersey	2	2	1755	0	0					
Spiegel	3	3	492	0	0					
Pennsylvania:						13	1	60	12	610
Lehigh Valley	32	9	5865	23	9050					
Spiegel	1	0	0	1	90					
Schuylkill Valley	11	6	4419	5	3647					
Upper Susqu. Val	4	3	2574	1	600					
Lower Susqu. Val	10	4	3716	6	2221					
Lebanon Valley	11	8	5542	3	2355					
Spiegel	1	1	534	0	0					
Pittsburgh	30	28	57060	2	3873					
Spiegel	2	1	1908	1	1900					
Shenango Valley	16	9	14139	7	6909					
Western Pennsylvania	20	9	11922	11	5994					
Spiegel	1	1	700	0	0					
Maryland	5	2	4000	3	3650	4	0	0	4	569
Wheeling District	9	8	10313	1	1080					
Ohio:						7	1	50	6	440
Mahoning Valley	13	10	16279	3	3256					
Central & Northern	9	8	12694	1	1400					
Hocking Valley	2	1	300	1	550					
Hanging Rock	12	6	2642	6	1432					
Illinois	16	14	27609	2	1750					
Spiegel	1	1	965	0	0					
Minnesota	1	0	0	1	629					
Wisconsin	4	2	2080	2	1610					
Missouri	2	1	950	1	600					
Colorado	3	1	1000	2	2000					
Virginia	22	7	5024	15	9300	4	0	0	4	437
Kentucky	5	3	1496	2	1305	3	0	0	3	200
Alabama	30	18	18706	12	9100	12	1	270	11	2518
Mich., Mo. and Wis.						18	7	3393	11	4190
Tennessee	11	6	5035	5	3700	9	2	292	7	2310
Georgia	2	0	0	2	960	3	0	0	3	670
North Carolina	2	0	0	2	600					
New England						11	2	175	9	850
Texas						4	0	0	4	875
Utah						1	0	0	1	175
Oregon						1	0	0	1	275
Totals	304	175	223865	129	85725	92	16	4330	76	14119

SUMMARY.

Fuel.	In Blast.						Out of Blast.			
	Number.			Weekly Capacity.			Number.		Weekly Capacity.	
		Month Previous.	Year Previous.		Month Previous.	Year Previous.		Month Previous.		Month Previous.
Charcoal	16	17	16	4,330	4,967	5,470	76	77	14,119	13,777
Coke and Anthracite	175	178	177	223,865	232,672	228,960	129	125	85,725	82,543
Total	191	195	193	228,195	237,639	234,430	205	203	99,844	96,320

*Condensed from the *Iron Age*.

Foundrymen's Exhibit at Pittsburg.

Intending exhibitors at the coming convention of the American Foundrymen's Association to be held in Pittsburg during the third week in May will please communicate with Dr. R. Molddenke, 48th St. & Allegheny Valley Ry., Pittsburg, chairman of the committee on exhibits. Applications for space will be received up to May 1.

TWO MONTHS WITH THE COMBINE MAKERS.

That more than a billion dollars capitalization is footed up from the big companies formed in January and February under New Jersey charters, is the statement of the result of the merging of old companies and in some cases the creation of new ones since the opening of the year. The *Financial Chronicle* makes the comment given below and appends the table, in which will be found a number of companies identified with or closely related to the iron trade:

That caution is plainly necessary is evident from the magnitude of the capital additions being provided through these various combinations. We present below the statement which we have prepared to show the extent of the new organizations of this kind announced the present year. It should be distinctly understood that the statement covers simply the period since the first of January, and is made up on a very conservative basis. We have taken only the combinations which have been actually incorporated, or regarding whose organization there is no doubt. Such as have been merely talked about or suggested are disregarded entirely. We have omitted even combinations that are plainly in prospect, but which have not yet been definitely matured. Thus we have left out the whiskey "combine," now nearing completion, with an estimated capital of $128 000,000, the copper combination, with a proposed capital of $100,000,000, the smelters' and refiners'combination with a suggested stock of about $50,000,000, the contemplated consolidation of the bridge building interests, with an estimated capital of $50,000,000, that of the makers of writing, bond, ledger, and envelope paper, with a capital of $40,000,000, and several other similar suggested consolidations. Nor have we taken any account of the proposed increase of $35,000,000 in the stock of the American Tobacco Co. Here is the table, as compiled on that basis:

Name of Company.	Authorized Stock.	Capital Bonds.
American Beet Sugar Co.	$ 20,000,000	
American Brass Co.	20,000,000	
American Car & Foundry Co.	60,000,000	
American Ice Co.	60,000,000	
American Last Co.	3,500,000	
American Radiator Co.	10,000,000	
Amer. Saddle Co., (bicycle saddles)	1,800,000	
American Sewer Pipe Co	25,000,000	
American Silk Manufacturing Co.	12,500,000	
American Soda Co.	1,000,000	
American Steel & Wire Co. of N J.	90,000,000	
Borax Consolidated	12,000,000	
Central Union Gas (natural gas concerns)	24,000,000	
Electric Boat Co.	10,000,000	
Electric co. of America.	25,000,000	
Electric Vehicle Transp'tion Co.	25,000,000	
General Chemical Co	25,000,000	
Havana Commercial Co., (Cuban tobacco)	20,000,000	
International Air Power Co	25,000,000	
K'y Distilleries & Warehouse Co.	32,000,000	
Maryland Brewing Co.	6,500,000	$7,500,000
National Carbon Co.	10,000,000	
Nat. Enameling & Stamping Co.	30,000,000	
National Salt Co.	10,000,000	
National Steel Co.	59,000,000	
Nat. Tin Plate & Stamped Ware Co.	20,000,000	
National Tube Co.	60,000,000	
New England Dairy Co., (milk companies)	30,000,000	
New York Auto-Truck	10,000,000	
New York Gas & Electric Light, Heat & Power	36,000,000	36,000,000
Pacific American Fisheries Co	5,000,000	
People's Lt. & Power Co., of N. J.	20,000,000	
Pittsburg Brewing Co.	13,000,000	6,500,000
Pressed Steel Car Co	25,000,000	
Royal Baking Powder Co	20,000,000	
Rubber Goods Manufacturing Co.	50,000,000	
Standard Sardine Co.	5,000,000	
Union Bag & Paper Co.	27,000,000	
United Lighting & Heating (oil lighting interests)	12,000,000	
United Shoe Machinery Co.	25,000,000	
U. S. Cast Iron Pipe & Foundry	30,000,000	
United States Varnish Co.	36,000,000	
Virginia Iron, Coal & Coke Co.	7,500,000	7,500,000
Grand total	$1,048,800,000	$57,500,000

"It thus appears that in the two months of this year there have been definitely formed new combinations having an authorized capital of $1,048,800,000 of stock, with $57,500,000

of bonds, making $1,106,300,000 for the two months. This is in addition to the $916,176,000 reported for the calendar year 1898, as shown in our issue of Jan. 7, 1899. It is proper to say that the table above includes two companies which were also included in our previous exhibit, but for very much smaller amounts then—namely, the American Steel & Wire Co. and the New York Gas & Electric Light, Heat & Power Co., the scope and capital of these two consolidations having been very greatly enlarged the present year. Nevertheless the total of $916,176,000 may be regarded as substantially unchanged, for though the two companies referred to have been transferred to the 1899 list, the capital of several other companies remaining in the 1898 column, it turns out, must now be placed much larger than we originally put them—American Potteries, for instance, $40,000,000, against $27,000,000, and Union Tobacco $24,000,000, against only $10,000,000. It is correct, therefore, to say that the $1,106,300,000 of new capitalizations for the present year are in addition to the $916,176,000 for the calendar year 1898, making over two thousand million dollars together. But the $1,106,300,000 covers only two months, and hence this movement is now proceeding at the rate of six thousand million dollars a year. Totals of such magnitude carry their own comment, and it is unnecessary to say anything to add to their force and significance."

FOUNDRYMEN'S ASSOCIATION.

Protection for the trade against what was termed the "credit evil" formed a basis for considerable discussion at the last meeting of the Foundrymen's Association, held at the Manufacturers' Club, Philadelphia, March 1. Although the topic was productive of a great amount of argument, no practical suggestion, outside of an official black list, was offered which would tend to eliminate the evil of buyers running up their credit to the limit for castings with a concern and then transferring their patronage to some other house. Cuts in prices came in for the usual share of discussion but as this subject had been thoroughly ventilated by the association, nothing new was brought up on this score.

A paper on "Testing Machines," illustrated by stereopticon slides, was read by F. A. Riehle, and Secretary Evans submitted a description of a new pulley molding machine, also illustrated. In connection with Mr. Riehle's paper which appeared in full in last week's issue, views were given of the following:

300,000-lb. Riehle vertical screw power testing machine, with movable upper head. 200,000-lb Riehle machine, automatic and autographic. 100,000-lb. Riehle machine, automatic and autographic, known as "Washington." Riehle-Gray weighing apparatus, a device designed by Prof. Thomas Gray. Riehle Paine extensometer (for 5-ft. specimens, such as used by Roeblings, of Trenton). 50,000-lb. Riehle vertical screw power testing machine, automatic. Riehle chain tester. Extra heavy spring testing machine (built for Chas. Scott Spring Co.,) 120,000 lbs. capacity. Several illustrations of Riehle foundry transverse testing machines. 1,000-lb. cement testing machine, (such as used by the U. S. Government). Riehle abrasion cylinder. Riehle abrasion testing machine for 12 in. cube specimens. Torsional wire testing machine. A view of a brake beam in position on a testing machine, taken during progress of the testing. Several views of tests made by U. S. Government, Gen. Gillmore, of timber, cement, and some tests of tensile specimens tested by Unwin. Some tests made by Columbia College, New York. The above slides were loaned by Prof. Ira N. Woolson, of Columbia College.

THE Falcon Bronze Co., of Youngstown, O., received part of the contract for the supply of brass for one year to the American Tin Plate Co. The contract includes hot-neck bearings of bronze, cold-neck bearings for cold rolling mills, anti-acid metal castings, including cradles, bolts, rods, picklers and all castings used in and around the picklers.

THE West Duluth, Minn., furnace which passed into the hands of the bondholders last fall, will soon be started again, it is reported. Its capacity is about 100 tons a day. Minnesota ores, chiefly from the Mesabi range, will be used.

POINTS TO BE STUDIED IN EXPORT TRADE.

Robert Grimshaw, writing from Dresden to *American Trade*, tells of some hindrances to the export trade, which belong in the category of consular ignorance, and some which lie at the door of our own manufacturers:

"In suggesting a 'consular school' I did not propose the continuance of the quadrennial decapitation system, which is one which no life insurance company anxious to get and keep foreign business would carry out. Foreigners laugh at our consular appointments and changes but do it quietly, as they see advantage to themselves in not calling our attention to it. I propose that after 1900 no consul shall be appointed who is ignorant of the official language of the country in which he is to work, except in the case of those countries or colonies where the principal European languages are more advantageous. I also suggest that no consul be retained after 1902 who cannot meet these linguistic requirements.

"Recent business visits to Bohemia and Hungary satisfy me that in these two countries the 'official' German must be supplemented by Chechisch and Hungarian respectively. I recently sent back a short-paid letter from a firm unknown to me. Like Noah's dove, it "came back after many days," full paid and containing, for reply, a self-addressed envelope with a United States five-cent stamp affixed. Do Americans imagine that United States stamps are taken in the German post-office?

"In sending an order to a prominent manufacturer from Wien (Vienna) I enclosed the original letter in order to show a picture of the factory and give an idea of the firm's importance. The machine was shipped directed to Wien, Germany, and I received a letter requesting me to state, in future, the name of the country. I counted on Americans knowing the German name of the fourth city in Europe and where it was. I get letters directed 'Dresden, Austria,' correspondents thinking that the A in 'Dresden A' (meaning the Alstadt side of the river) stands for Austria.

"I get freight shipped to Dresden via Liverpool, in spite of positive orders to send by Hamburg steamers. There are now seven or eight unpaid packages for me in various express offices in Hamburg, Bremen and Dresden, probably samples—senders and contents unknown. I get quotations f. o. b. Kalamazoo or other inland towns. They are useless. I don't know the local freight rates nor the constantly changing classifications and have neither time nor inclination to find out. From New York I can figure cost to me, if net and gross weights and size of containing packages are given.

"I have just receivd a case containing excelsior thoroughly saturated with and hardened by the contents of a poorly stoppered can of varnish sent as a sample. Do my countrymen imagine that the steamship company and other common carriers hang such sendings in gimbals to keep them upright, or that each package has a man assigned to it, to hold it right side up in his lap all the way here?"

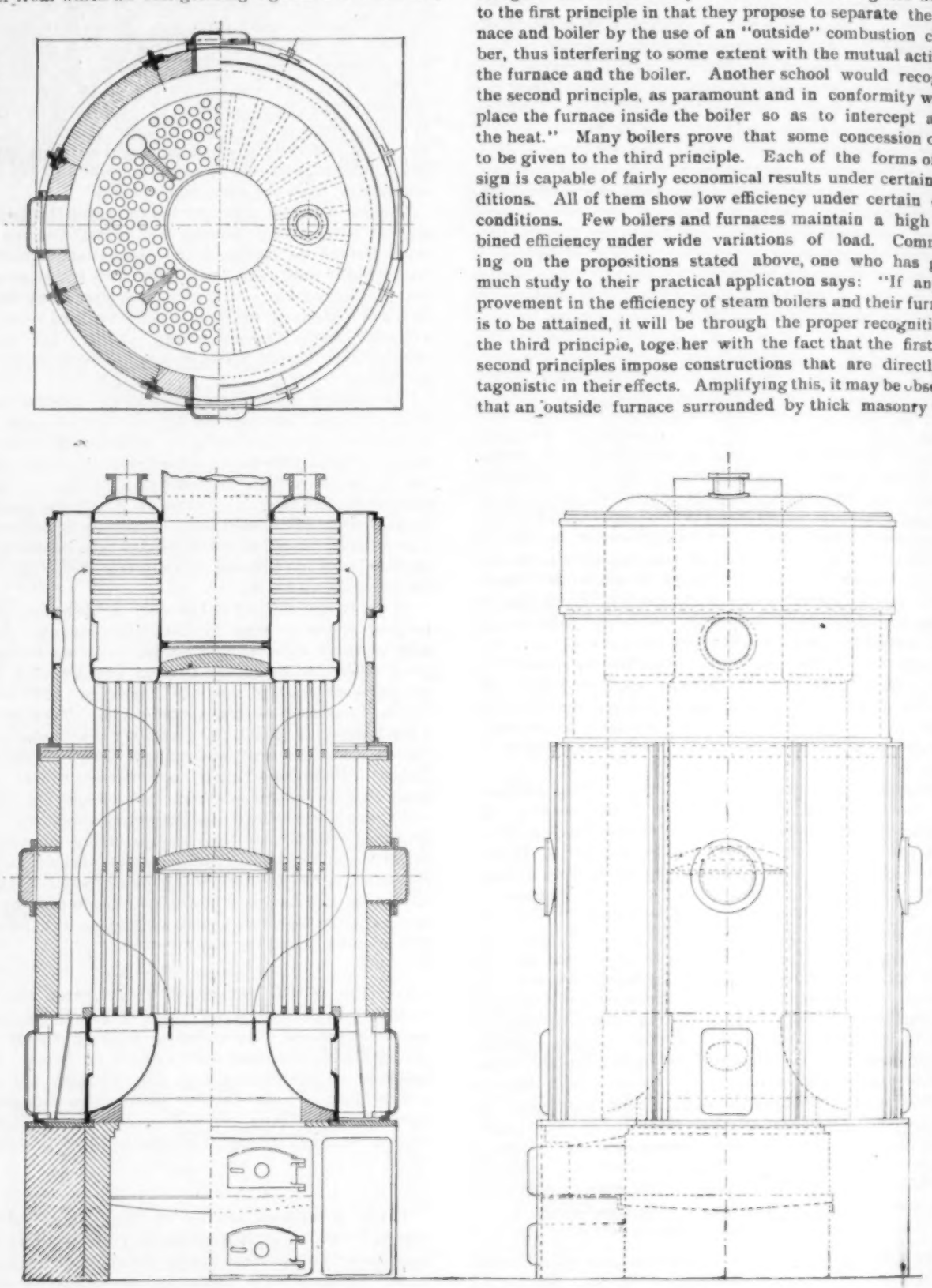
THE plans of the Naugatuck Valley brass combination, recently incorporated with a capital of $20,000,000, are pretty well arranged and it is stated in banking circles at New Haven, Conn., that there will be issued no bonds. A stockholder in the combination says that probably all the stock will be taken by owners of the combination factories, which have generally been prosperous as individual concerns, though they have suffered somewhat by competition with each other.

THERE is unusual activity in the Lehigh valley. The Thomas Iron Co. at Hokendauqua, Pa., has every stack in blast, and the Crane Iron Works at Catasauqua, will soon be in full operation. The Emaus furnace, which has been idle for several years, is about to start up, and the No. 5 stack of the Allentown Iron Works, idle for a year, will also become active. The ore beds of Moetz & Schraden are being reopened and will furnish a portion of the ore for the Crane Works.

THE Miller, Wagoner & Fieser Co., Columbus, O., has leased New York Furnace at Shawneetown, O., and it will be put in blast as soon as possible.

A NEW WATER TUBE BOILER.

Study of the principles involved in the development and transmission of heat has revealed certain things as essential in the attainment of the best results. They may be summarized thus: 1. The highest development of heat from a given quantity of fuel involves the combustion of the fuel in a chamber from which all refrigerating agents are excluded; 2. The greatest efficiency of heat transmission to the water or other receptive agent can be attained when all of the heat emanating from the heating agent is intercepted by cooling and transmitting surfaces. This involves completely enveloping the space occupied by the heating agent by heat absorbing surfaces. Transmission of the heat is limited to the two processes of radiation and conduction. 3. The heat liberated by radiation is dependent largely on the temperature of the heating agent Under its action a unit of heating surface shows by experiment a higher efficiency of transmission than it would give with conduction as the process of heat transfer.



A NEW WATER TUBE BOILER—PLAN AND ELEVATION.

The design of the modern steam boiler gives ample recognition of the foregoing statements singly; but many do not recognize them collectively. One school of designers adhere to the first principle in that they propose to separate the furnace and boiler by the use of an "outside" combustion chamber, thus interfering to some extent with the mutual action of the furnace and the boiler. Another school would recognize the second principle, as paramount and in conformity with it place the furnace inside the boiler so as to intercept all of the heat." Many boilers prove that some concession ought to be given to the third principle. Each of the forms of design is capable of fairly economical results under certain conditions. All of them show low efficiency under certain other conditions. Few boilers and furnaces maintain a high combined efficiency under wide variations of load. Commenting on the propositions stated above, one who has given much study to their practical application says: "If any improvement in the efficiency of steam boilers and their furnaces is to be attained, it will be through the proper recognition of the third principle, together with the fact that the first and second principles impose constructions that are directly antagonistic in their effects. Amplifying this, it may be observed that an outside furnace surrounded by thick masonry walls whether they be cooling walls or boiler heating surfaces or excess of air. affords a construction favorable to the development of the highest amount of heat per pound of fuel. The interception of this heat by surfaces other than boiler surfaces, sacrifices the advantage of high efficiency of heat transmission per unit of surface. Radiation, it is true, continues at a reduced rate from the hot gases to the boiler, but without the advantages attending radiation from a bed of incandescent fuel. On the other hand, absorption of heat by radiation is favored

by the "inside furnace" or fire-box construction wherein the bed of fuel is surrounded by heating surfaces of the boiler; presenting by their near proximity, unfortunately, a cooling agent which interferes with the attainment of a temperature of fire which is necessary for complete combustion."

On the theory that a furnace and boiler which would give the highest efficiency would involve a compromise between the two extremes of design, a boiler has been designed and patented recently, by F. G. Gasche, of Chicago, embodying the features of construction shown in the accompanying illustration. The elevations, sectional half-plan and half-plan show the boiler without the smaller details, such as hand holes, feed pipe and blow off.

It consists of an annular water chamber externally of cylindrical form and internally of a flanged cone-shaped piece formed of a single plate. These cones are being made from a flat plate without perceptible reduction of the thickness in the completed form. A gradual reduction of the sectional area of the central opening favors an intimate mixture of the combustible gases and the air which may enter above the fire. The top of this annular water chamber constitutes a tube sheet. Vertical and relatively short water tubes connect with the top water and steam chamber. The latter is composed of two concentric cylindrical shells, held together by the dished head at the top and the companion tube sheet at the bottom. Horizontal fire tubes join the two cylindrical shells through a portion of their length and serve as a passage of the flue gases to the stack, while at the same time a certain amount of super heating of the steam is secured.

Arches and draphragms deflect the products of combustion in three passes across the water tubes. The contact of the products of combustion and the tube surfaces is most intimate and a laminar or parallel flow of the gasses with its attendant losses is avoided. Hand holes in the top of the boiler serve for the removal of such tubes as cannot be easily handled from the exterior.

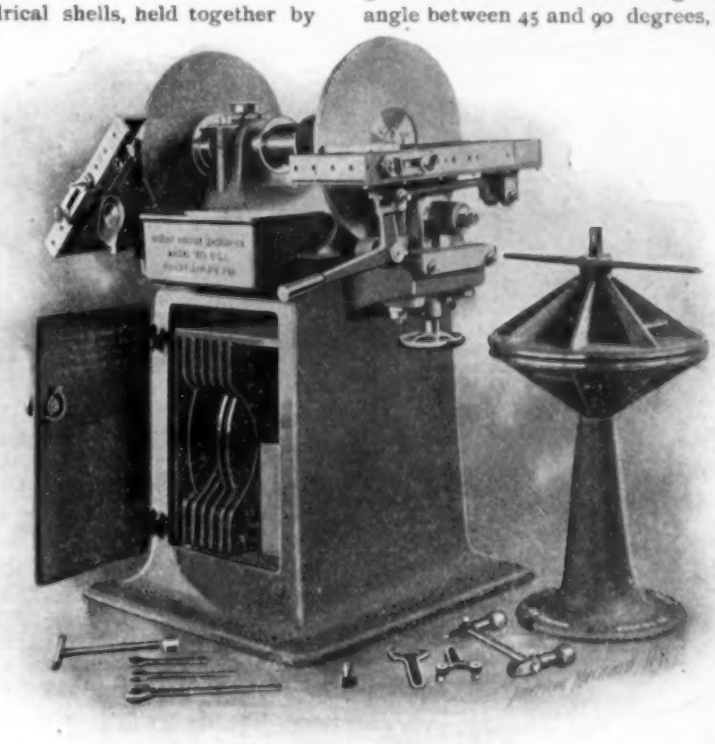
A sectional removable casing, formed of plates, and supporting a non-conducting lining, surrounds the boiler so that all of the external boiler surfaces can be exposed without the expensive repair of brick work for subsequent operations. Cleaning doors attached to the external casing provid for the ready removal of flue dust, or soot, even during the times when the boiler is in service. This feature would render the construction especially convenient for blast furnace plants. No horizontal heating surfaces exist where the accumulation of dust can impair their value. This observation applies to the interior surfaces with reference to the scale-forming matter in the water. The boiler is accessible internally and externally for all forms of cleaning, repairs and inspection.

The heating surface presented to direct radiation from the fire is very large. The fact that the products of combustion must come in contact with a considerable amount of heating surface, and thereby deliver much of their heat leads to the supposition that subsequent contact with the outer casing will be accompanied by insignificant radiation losses. Though not yet manufactured for the market, it is expected that the boiler will be available to steam users in the near future.

Among the advantages claimed by the inventor are the following: Low cost of installation; high economy with extreme variations of working conditions; high attendant economy at a multiple expansion plant, owing to the delivery of superheated steam; small floor space and small cubical space per horse power; accessibility of parts for cleaning repairs and inspection; ready adaptation of the furnace to stokers and gas burners; low draft requirements.

DISC SURFACE GRINDING MACHINE.

The disc surface grinding machine shown below is one of the specialties of the George Gorton Machine Co., of Racine, Wis., and it has several features which are worthy of attention. It is designed, in general, for the rapid and accurate finishing of metals, hard or soft, it will grind off rough surfaces on drop forgings, dies etc., or do fine finishing work. Its particular adaptation is to the finishing of dies, gibs and keys, wrenches, nuts, engine straps, chuck jaws, parts of machine tools, sewing machines, electrical work, etc. It will grind faces to an accurate right angle or any intermediate angle between 45 and 90 degrees, and produce parallel surfaces. Emery cloth or paper can be cemented to the discs by means of a press furnished, providing a true cutting surface for accurate work. The high speed (1,800 revolutions) and the absence of grooves in the discs cause them to cut much faster than a solid wheel. The emery cloth or emery paper discs are secured to both sides of the steel discs with a quick drying cement used cold and requiring one half to three-fourths of an hour to dry. Worn sheets are readily stripped from the steel discs.



DISC SURFACE GRINDING MACHINE.

The discs are 18 inches in diameter, mounted on a special steel arbor. The right hand sliding table is controlled by the means of a hand lever, and has a steady motion at all points of its stroke, without jerk or vibration on the heaviest cuts. The sliding surfaces are self-oiling, dust proof, and cannot be exposed when changing discs. The slide supporting the table has a vertical adjustment of three inches by means of screw and hand wheel. The working surface of table top is 8 inches wide by 18½ inches long and accurately square with the face of the disc. It is provided with a protractor tee square graduated in degrees.

The bevel table shown at the left is 12½ inches wide, 16½ inches long, provided with protractor tee square graduated in degrees. This table has a graduated angular adjustment through 45 degrees, also lateral adjustment for placing top plate close to disc. The vertical adjustment is five inches. The steel discs are quickly changed without losing any adjustment of the tables The flat surfaces are carefully scraped to surface plates and the machine is accurately and carefully made throughout to standard gauges, all parts being interchangeable. The weight is 1,635 pounds, an exceptionally heavy machine.

LAKE SUPERIOR IRON MINING METHODS.—III.*

BY DR. NELSON P. HULST.

The Pewabic Mine.

A very successful method of mining ore by a system of caving has been devised by E. F. Brown, manager of the Pewabic mine. This mine is situated on the Menominee Range and lies within a short distance of the Chapin mine. This method proves to be particularly well adapted to the conditions existing at the Pewabic mine. Itis described by Mr. Brown as follows:

The system of mining herein described has been in successful operation at the Pewabic mine, Iron Mountain, Mich,. for a period of three years and about 600,000 tons of iron ore have been extracted from the points in the mine where it has been found advantageous to make use of this method exclusively. This system has been employed most extensively upon a large body of highly silicious hard hematite ore averaging from 40 per cent to 50 per cent in iron. For convenience in operating the ore body is first divided into blocks having a length on the trend of the strata of about 250 feet; the width of the block depending upon the distance between the slate walls or foot and hanging. The height of the blocks is the distance between levels, ordinarily 100 feet. The accompanying plates show one of these blocks of ore in various stages of preparation for actual mining; also the condition of the overburden, consisting of broken sand-stone and old timber, which had been caved by earlier mining operations.

Plate No. 1A shows the plan of crosscutting and raising in blocking out the ore; also the location of the ore with reference to the main levels. The main level is driven in the hanging wall slates, about 20 feet from the ore body, and parallel with its trend. From the main level, crosscuts are extended across the ore body of the foot wall. We usually make four crosscuts, these dividing a block of ground 250 feet long into three blocks about 80 feet each. Adjacent to the two crosscuts which mark the eastern and western boundaries of the original block, we start up raises 50 feet distant from each other, and extend these up raises 80 feet, or within 20 feet of the level immediately above.

Plates Nos. 4A and 5A are vertical sections taken through A-B an C-Don Plates 1A and shows the up-risingsin detail. Chutes are constructed at the bottom of the up-rises, and commencing at the top underground stoping is carried on until a trench eight feet wide and 80 feet deep has been cut across the ore body from foot hanging wall. In the underhand stoping the ore falls into the chutes taken out. The objects of these sub-drifts are to provide a means of exit for the miners in case of accident, "two ways out" being the rule; for ease of communication and for getting timber into the openings. In some parts of the old workings, where the rooms were not beat up too high, sub-drifts are made use of, but where there is filling to be driven through they are driven only in exceptional cases. In places where the ore is wide, there may be two drifts; one near the foot and one near the hanging, with the necessary rises, so that there are two separate parties caving on the same block. Care is always taken that no caving is done until the party above is out of danger of having their ground caved under their feet. The caving system, with the addition of sub-drifts, is also applied to ground which has not been roomed and which has a heavy capping of jaspillite. The method of working is essentially the same, with the advantage that there are no filled rooms on each side of the pillars.

The levels are 100 feet apart vertically and connected every 50 feet by raises. These raises are in turn connected by subdrifts, that is, intermediate drifts between the levels. The

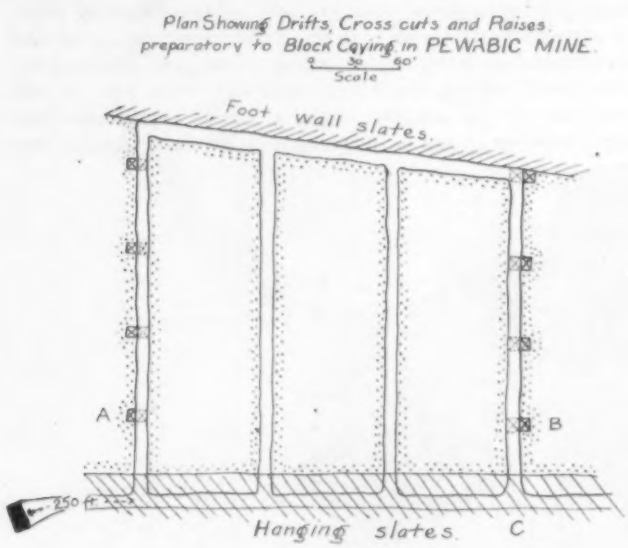


PLATE I. A.

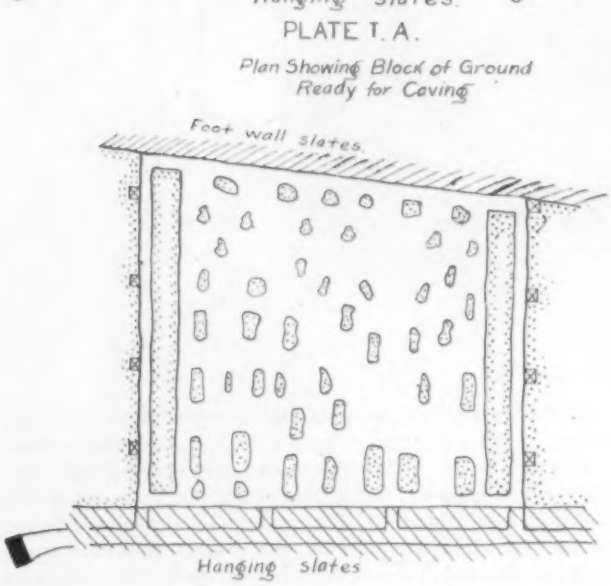


PLATE II. A.

PLATE III. A

Longitudinal Section

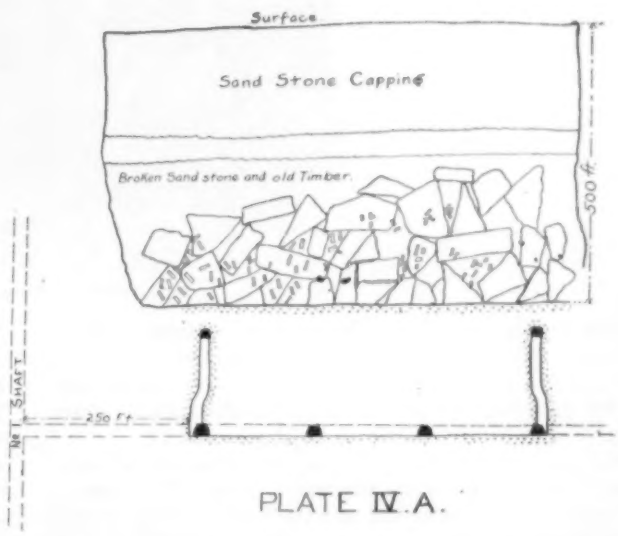


PLATE IV. A.

* Read before the Engineers' Society of Western Pennsylvania, at Pittsburg, Feb. 21, 1899.

ground is then cut up into blocks by crosscuts and drifts and caved in the same way the pillars were when blasted, and is run into the tram cars without being handled. During the time required to cut the trenches across the ends of the block, we are also employed in undercutting it, and when the trenches are completed, we have the bottom of the block about in the condition shown by Plate No. 2A. That is, we have two strong pillars alongside of the main crosscut on the ends of the block, while the balance of the ground is resting on small legs of ore, irregular in size and shape.

These legs and pillars are then made as small as is consistent with safety to our miners. The remaining portion is then drilled, and when all have been drilled, they are blasted in sections. The end of the blocks being cut off, and the entire block thoroughly undercut, the ore soon begins to cave. This usually occurs in large masses of many hundred tons each.

The work of mining is now commenced by allowing the caved ore to run into the drifts and crosscuts through the opening in the end or breast of each. The broken ore is simply shoveled into the tram cars and taken to the shafts, the breasts of the drifts always being full of broken ore. When a full output is desired, the crew consists of one miner and four shovellers at each of the points in operation. Two of the shovellers are always employed in filling the ore, while the other two are trimming it to the main level. No drilling is required, and but little powder is used in blasting this caved or crushed ore.

Drawing the ore in this manner forms funnel-shaped spaces in the body of broken ore, and these are eventually filled by the caving of the timber and broken sand-stone from the old level above. When the ore has been so far removed, at any point, that the waste material is shown in the working-faces, we blast a few of the timbers in the drift and draw our

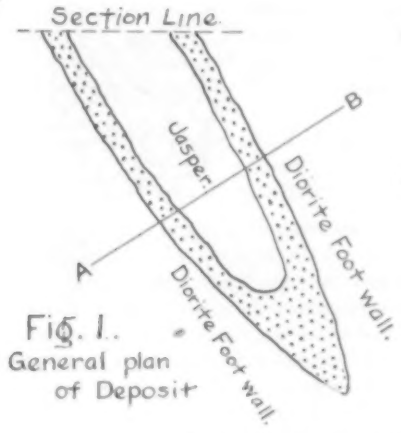


Fig. 1.
General plan of Deposit

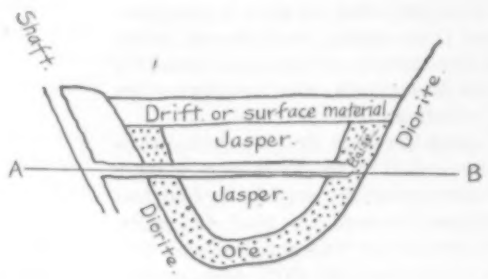


Fig. 2.
Section through AB.

LAKE ANGELINE MINE.
ORE

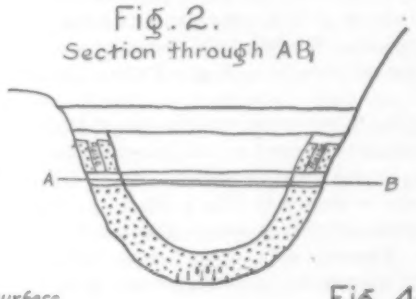


Fig. 4.
Showing angle of raise.

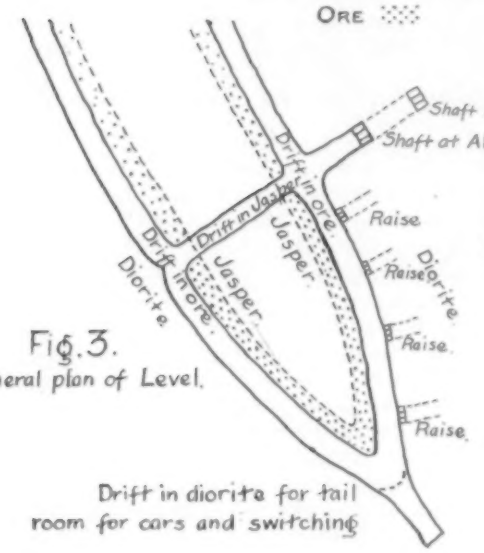
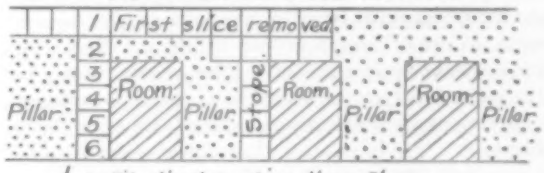


Fig. 3.
General plan of Level.

Drift in diorite for tail room for cars and switching

Fig. 5. Jasper hanging.



Longitudinal section through ore deposit showing filled rooms and standing pillars.

Fig. 6.

PLATE IV.

Ore Crushed by Settling.

To illustrate the hardness of the ground and the results obtained, it may be well to state that no timber is used in prosecuting the work just outlined, and that it requires several weeks for a block of this ore to settle a distance of seven feet, but within six or eight months the ore becomes crushed so that four-fifths of the entire block could be put through a three-inch opening. After the block of ore has settled down to the original level, and been sufficiently crushed to allow easy driving of crosscuts, the two crosscuts in the central portion of the block are advanced through the caved ore, and from these crosscuts drifts are run to the eastern and western boundaries of the caved territory. These drifts are usually located about 25 feet apart on the line of the crosscuts, and the general plan of the drifting-work is shown in Plate 3A. The drift nearest the foot wall is connected with the adjacent crosscut, and from this drift short crosscuts are extended, at intervals, to the foot wall. These drifts and crosscuts are all closely timbered, and after the initial timbering they require but little attention in the way of repairs.

point of operations nearer to one of the main crosscuts. This operation is continued and repeated until the ore in the territory formerly traversed by the drifts, has been exhausted and replaced by the waste from above. Other drifts from the main crosscuts are then driven in the pillars remaining between the first drifts, and the operation repeated as in the first work In actual work it is found possible to draw the ore for three or four feet on either side of these drifts, consequently the second set of drifts practically clean up the broken ore.

The typical block of ore, herein described, was caved during the fall of 1897. This block contained originally about 350,000 tons of ore and it has yielded about 120,000 tons during the present shipping season. A much larger output could have been obtained if desired. We have never had any fatal accidents in connection with operating under this system, and it can, without exaggeration, be called a safe method of mining. With modifications to accommodate varying conditions, this system has been applied to the mining of our soft ore bodies, and the results obtained in this direction have been satisfactory to us.

The Lake Angeline Mine.

At the Lake Angeline mine, situated near Ishpeming, in the Marquette District, a method of mining by the system of caving has been practiced for a number of years. The engineer of this mine has kindly given me a written description of it, which is herewith repeatd.

Before describing the method of mining in use at the East End mine of the Pittsburg & Lake Angeline Iron Co., an explanation will be given of the plates showing several plans and sections of the mine. They are not drawn to scale, simply rough sketches to show the method of mining.

Fig. 1 Plate 4 is a general plan of the deposit. Fig. 2 Plate 4 is a cross section through AB, showing the location of the shafts in the foot wall and drift crossing deposit. This same drift is shown in Fig. 3 Plate 4 crossing the jasper or silicious ore formation forming the hanging of the deposit, and connecting the main working drifts in each side of the deposit, as shown in Fig. 3 Plate 4.

From the sketches it will be seen that the shaft is put down in the diorite foot wall, and from which the different levels are driven to and crossing the deposit. From these crosscuts the main working drifts are driven each way lengthwise the deposit, as shown in Fig. 3 Plate 4.

At intervals of 100 feet along the main working drift, raises are put up to the top of the deposit as shown in Fig. 3 Plate 4. The raises have three compartments, each about four feet square. The compartments at the ends are used for mills. That in the center is used for ladder-way and timber. The course of the raise is at right angles to the drift and inclines toward the foot. If possible, or if it is convenient, the angle of the raise is about 60 degrees. We find this the most convenient angle for a raise for all purposes. Fig. 4 Plate 4 illustrates the above.

The raises are carried up to the top of the ore deposit, and from it, and in the ore directly under the sand or surface material, drifts are driven each way lengthwise the deposit for 50 feet or half way to the next raise as shown in Fig. 4 Plate 4. At the ends of these drifts, drifts are driven across the ore body to the foot and hanging. Parallel with these cross drifts, side drifts are taken out in succession until the ground at this level is sliced back to the raise, as shown by dotted line in Fig. 5 Plate 4.

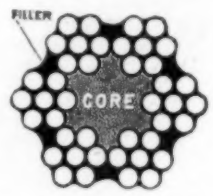
The ground or material above the position worked out is allowed to come down itself, or is brought down if necessary, for the safety of the workmen. Immediately after finishing a slice, and before ground above is allowed to fall, the bottom of the workings is covered with poles, lagging, slabs, or any waste material which will form a support to the covered ground while the ore is being removed below it. This stoping or slicing is carried on until the ore has been mined out down to the main level, or as close to it as is convenient, when the operations are transferred to a level below and the ore milled down to it. The cross drifts in stoping or slicing average about nine feet wide and eight feet high. The timber used for legs and caps is from eight inches to 12 inches in diameter and mostly Norway pine. The lagging is cedar, and of ordinary size; the poles of any strong timber of convenient size. The distance between the sets of timber may vary to suit the conditions.

At the old mine previous to the last three or four years, the system used was that of "room and pillars," and the upper portion of the mine practically was laid out and worked on that plan. At present all work is on pillars. They are removed in the manner described as follows: Fig. 6 Plate 4 is a longitudonal section through the ore deposit, showing filled rooms "R" and standing pillars "P." The rooms are lengthwise across the formation from foot to hanging and are about 18 feet wide and were filled immediately after working from the level above through a mill "M." In removing the pillars and floors, a single stope one set wide and extending from foot to hanging is carried up to the workings above as shown by "1, 2, 3, 4, 5." This whole stope may serve as a mill in removing the ore at the sides under the old workings. In removing the ore at the sides, the first slice is taken off immediately under the old working above, and extends half way to the next stope or to "X," and so on, using the caving system. The ore is shoveled or runs directly into the stope and no tramming above is necessary.

(To be continued.)

PRESERVATION OF WIRE ROPES.

The acquirement of a material for treatment of the manila or jute core in the process of manufacture of wire ropes, possessing pliability, lubricating and waterproof qualities, and free from destructive acid, has been diligently sought by wire rope manufacturers. There are numerous places where wire ropes are liable to become water-soaked almost immediately after installation (where not specially prepared to resist moisture), such as cable railway service, wet mines, dredging machinery, power transmission, and in many other places of exposure. The wire ropes of elevators in offices, stores, warehouses, and general buildings sometimes show an outside corrosive effect, which too often is but suggestive of the more serious hidden internal conditions. Not infrequently the interior of wire ropes reveal disintegrated cores, and corroded wires, even where there may be but little evidence of deterioration externally. The illustration herewith presented



shows application of a special material known as "wire rope filler," by which the core is lubricated, and a flexible cushion interposed between it and the strands. The filler exuding between wires prevents abrasive wear, seals against acid, gaseous, sulphurous or water attacks, and forms foundation on which an outside coating should speedily build. Many of the prominent wire rope manufacturers have adopted the use of this filler on all kinds and sizes of operative wire ropes. The manufacturers of this filler also make an outside coating termed "wire rope shield," for external protection against abrasive wear, and to completely seal against exterior attacks. A substantial increase of life is evident from the internal treatment, and furthered by the external protection. The Ironsides Co., Columbus, O., manufactures these materials.

Willard S. Mattox, European representative of Rogers, Brown & Co., who is now in this country, says: "The position of American pig iron in Great Britain is this: Where one year ago we were offering concessions to English consumers, begging them to try our iron, now they are coming to us and eagerly accepting all the iron we can spare. They would scarcely look at it then at a reduction of 5 or 6 shillings from the price of English iron. Now they accept it at one shilling less, or even, in some cases, six pence less. Peter Donaldson, of James Watson & Co., Glasgow, one of the largest dealers and speculators in pig iron in the world, after a visit in this country, has just returned to Scotland. He has been in Tennessee, Alabama, Virginia, Ohio, New York, all through the South and East, during the past three or four weeks, trying to enlarge his connections and to get control of some American supplies of pig iron."

Jeremiah Head and Archibald Head, well known in the United States, through their connection with the Otis Steel Co., read a paper before the Institution of Civil Engineers at London, Feb. 14, on "The Lake Superior Iron Ore Mines and Their Influence upon the Production of Iron and Steel." A comparative table of the estimated costs of producing pig iron at Pittsburg and at Middlesbrough, Eng., showed that at the former place the cost is probably about £1 8s. 9½ d., and at the latter about £2 8s. 10d. A comparative table of selling prices showed that in steel rails, steel ship plates, and steel billets and blooms, Pittbsurg prices were considerably below Middlesbrough prices. The authors believed that Lake Superior iron ores, aided by Pennsylvania fuel, were likely to have a permanent effect in cheapening iron and steel throughout the world, and should tend to encourage the production of such goods, and especially of ocean-going ships and engines in the United States ports to an unprecedented extent.

At New Castle, Pa., the plant of the Atlantic Iron & Steel Co. started up last week, after an idleness of months.

MECHANICAL DRAFT VS. CHIMNEY DRAFT.

"Mechanical Draft, What It Is, and What It Does," is the suggestive heading of one page of Bulletin J., just issued by the B. F. Sturtevant Co., Boston, Mass. As stated, "It *is* draft mechanically produced by means of a fan, and may be introduced either as forced draft, by which the air under pressure is delivered to the ash pits, or as induced draft, arranged to draw the gases through the fan and to maintain a partial vacuum within the furnace. The method to be adopted must depend of necessity upon the existing conditions.

"It *does* what an ordinary chimney is incapable of doing. Its cost is from 20 to 40 per cent of that of chimney. Its intensity permits of the burning of finely divided or low grade fuel. It makes possible the utilization of the heat of the flue gases which chimney wastes in producing draft. It is independent of the weather; is automatically regulated to maintain constant steam pressure, prevents smoke, increases the capacity of an existing plant, and serves as an auxiliary to chimney already overburdened. It saves space and is portable."

The illustration which is shown herewith of a chimney, and a fan applied for draft production, presents graphically the relative sizes of these two means of producing draft. They

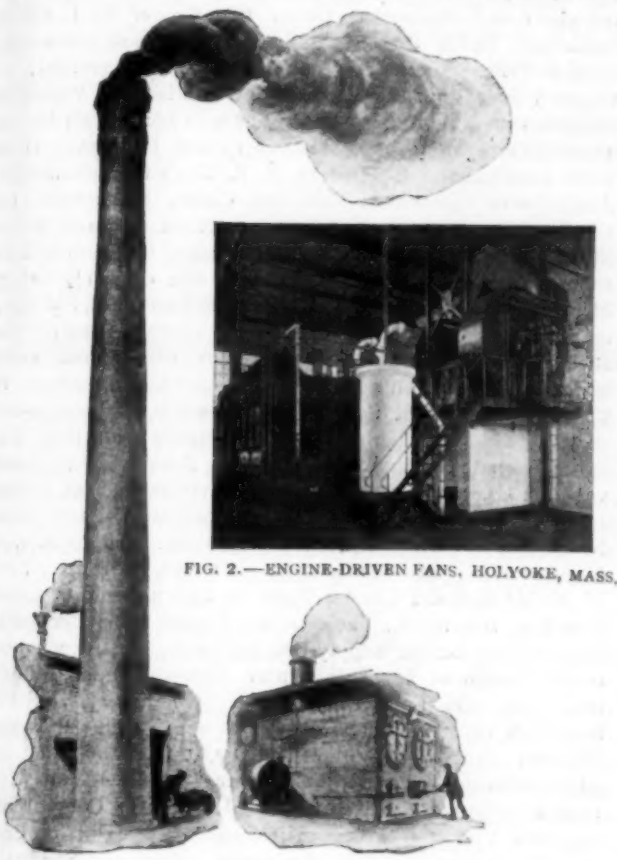


FIG. 2.—ENGINE-DRIVEN FANS, HOLYOKE, MASS.

FIG. 1.—SHOWING SIZE OF CHIMNEY AND OF FAN, FOR SAME BOILER CAPACITY.

are both drawn to the same scale, and are both capable of operating the same sized boiler plant. The chimney is sixteen timesas high as the fan, it is not portable, is almost valueless when abandoned, while the fan may be readily moved, and is usually a valuable asset.

The smaller engraving, Fig. 2, serves to illustrate the induced method of application. This plant is at the Holyoke Street Railway Co., of Holyoke, Mass., and the mechanical draft apparatus consists of two fans equipped with direct connected engines, automatically regulated to maintain constant steam pressure.

The bearings are water cooled, so that the gases can be handled with impunity, and each fan in this case is of sufficient size to operate the entire plant. The short stack extends just above the boiler house roof. An arrangement like this naturally lends itself most readily to the introduction of a fuel economizer, whereby the wasted heat of the gases required to produce draft for the chimney may be utilized when the fan is employed. Recent tests of nine different boiler plants equipped with mechanical draft apparatus and economizers showed an average fuel saving of 14.6 per cent.

INDUSTRIAL SUMMARY.

New Buyers in the Market, and Some of Their Wants:—

[If you are in need of machinery of any description, please notify *The Iron Trade Review*, and we will put you in communication with our advertisers at once.]

Sealed proposals will be received at the office of the supervising architect, treasury department, Washington, until 2 p. m., April 14, for heating and ventilating apparatus at the United States Marine Hospital Building at Louisville, Ky.

New Construction:—

W. D. Kerfoot & Co. Chicago, has sold for the estate of Oliver Perin, Cincinnati, to H. W. Caldwell & Son Co., machinery manufacturers, twenty-four lots in 17th and 18th streets, Chicago. The Caldwell Co. also purchased from the Gaff estate of Cincinnati, eight lots in the same block, giving it an entire square, excepting the Western avenue frontage. The company are preparing to erect a $50,000 steel and brick foundry, warehouse and machine shop on the premises, abandoning their present location.

The contract for the erection of the Moline Plow Co.'s new foundry at Moline, Ill., has been let. The work is mostly steel construction and the cost will be about $65,000.

It is stated that the McCormick Harvesting Machine Co., Chicago, will expend close to $1,000,000 in extensions of its great Chicago plant. In the past year a new foundry has been built. The new additions include twine mills and a knife shop 60x163 feet. It is the expectation that the company will in time manufacture at its own plant all its malleable iron, knives for cutter bars, etc.

The Link Belt Machinery Co., Chicago, Ill., has increased its capital stock from $250,000 to $375,000, and has made plans for a new foundry 200x200 feet, of steel construction.

The Edward P. Allis Co. is preparing to erect an addition 600x150 feet.

The Baker Forge Co., Ellwood, Pa., will erect a new building 90x309 feet, greatly increasing their capacity.

Waltz Bros., connected with the American Foundry & Machine Works at Bowling Green, O., for some years, will build a machine shop, which will be devoted chiefly to oil field work.

The W. D. McNauli Foundry & Machine Works will be removed from Huntington, W. Va., to St. Albans, where an entire new plant will be erected as soon as a site is decided upon.

The Wilmington, Del., Malleable Iron Co., is building an addition to its plant.

Contracts have been awarded for the erection of two large buildings at the Lukens Iron & Steel Co.'s plant, Coatesville, Pa. When the improvements are completed the works will employ about 1,800 men.

Henry R. Worthington is building a new power house at his large foundry at Elizabethport, N. J., which, when equipped with tube boilers, air compressor, engines, and electric plant, will add over 50 per cent to present capacity.

The Industrial Works, Bay City, Mich., will be enlarged in the near future. The company is now working day and night, employing several hundred men.

Rock Run Furnace of the Bass Furnace Co., Rock Run, Ala., has been blown out for repairs.

Fires and Accidents:—

The plant of the Gray Iron Casting Co., manufacturer of iron novelties and shelf hardware, at Mt. Joy, Pa., was completely destroyed by fire March 11. Loss about $60,000, partly insured.

An engine ran away at the American Steel & Wire Co.'s plant at Newburg, Cleveland, the fly wheel being broken into fragments. At the Rankin, Pa., plant of the same company, the driving shaft of an engine broke, causing a shut down.

At Galesburg, Ill., the foundry of the G. D. Colton & Co.'s works was destroyed, with valuable patterns. The loss is $10,000, and insurance small.

The Charles Scott Co. Spring Works, Philadelphia, were destroyed by fire March 13, with a loss of $150,000. The hub works of John Buckley & Co., and the brass works of B. B. Hill, adjoining, were slightly damaged. The fire was caused by the sudden immersing of a hot steel spring in a vat of oil.

The Pittsburg District:—

Application for a certificate of incorporation for the Baker Manufacturing Co. will be made by Pittsburg and Tarentum business men. The concern is capitalized at $100,000, and a tract of land has been purchased at Tarentum, Pa. The incorporators include James H. Baker, formerly of the Baker Forge Co., and the Baker Chain Co.. The output of the plant will consist of forgings of all kinds, heavy hardware for wagons, and, probably a number of designs of chains. Most of the forgings will be made under special contracts, and will include shapes for railroad cars. Wrought iron anvils will probably be an article of manufacture. Work on the plant will begin at once. The plans embrace a forge 280x60 feet, together with a large machine shop, power building and boiler house, warehouse and shipping department.

The National Tube Works Co., Pittsburg, has received from London an order for $1,000,000 worth of 28-inch pipe. It is to be sent to Johannesburg, Transvaal.

The Park Steel Co., of Pittsburg, recently incorporated in New Jersey, offers in New York and in London for subscription $4,500,000 of preferred stock.

An engine of 1,500 h. p. will soon be installed at the Beaver Falls, Pa., mill of the American Steel & Wire Co.

The advance in wages made by the National Tube Works, at McKeesport, has led employes of steel works and furnaces to ask for a similar advance, which is likely to be granted.

The West Penn Steel Works, in lower Allegheny, have been purchased by H. G. Wasson, of Jennings & Wasson, for $50,000. Jennings Bros. & Co., Ltd., were the lessees. The plant consists of a ten-gross-ton acid open-hearth furnace, three heating furnaces, and two trains of 18 and 14-inch rolls, with an annual capacity of 8,500 gross tons of ingots and 10,700 tons of rolled products. No operations of consequence have been carried on for seven months. It is believed that the works will be run in connection with the new seamless tube works at Beaver Falls. B. F. Jennings is president and W. N. Howard, secretary.

The Westinghouse Machine Co. has contracted for a 250,000 worth of machine tools for its East Pittsburg plant, and when the equipment is installed, within the next six months, the company will be in position to manufacture blowing engines for blast furnaces and steel works, and reversing engines for rolling mill service up to 10,000 h. p. The company now has an order for 18 engines of 7,500 h. p. each, these being the largest it has turned out. They are for the Third Avenue Railroad Co., New York. The lathes and milling machines for the new plant are furnished by Manning, Maxwell & Moore.

The West Penn Foundry & Machine Co., of Avonmore, Pa., has about completed the erection of a pattern shop, 35x50 feet, to replace the one recently burned.

The Pennsylvania Pump & Supply. Co., of Pittsburg, made application on March 10 for a charter of incorporation. The incorporators are W. E. Ross, H. W. Sheets, Ross J. Cavanagh, G. S. Howland and John R. Cavanagh.

Charlotte Furnace, Scottdale, Pa., Corrigan, McKinney & Co., lessees, which has been idle for some time, will be repaired and put in operation. The lease of Corrigan, McKinney & Co. does not expire until next year. After a brief run on pipe foundry iron, the furnace will go on Bessemer.

The Acme Engine Co. has leased the building at 227 Third ave., Pittsburg, for a term of years and will carry in stock a line of engines.

It is learned positively, though unofficially, that the negotiations looking toward the purchase of the Canonsburg Iron & Steel Co.'s plant, Canonsburg, Pa, by the American Tin Plate Co., have just been concluded with the exception of some minor details, which will doubtless be arranged by the end of this week. The product of the plant has been largely fine sheet steel for stamping purposes, the tin plate output being confined almost entirely to fancy charcoal plates, while a considerable quantity of terne plates were also manufactured. Some time ago three additional mills were contracted for, to make the works an eight mill plant. The works also contain a three-high and a two-high bar mill. Outside of two concerns making limited quantity of tin plate for their own consumption, this was the only tin plate plant outside the consolidation.

An unusual transaction was consummated last week, when the Pittsburg & Lake Erie Railroad placed provisional contracts with structural mills, through the Schultz Bridge & Iron Co., McKees Rocks, Pa., for 1,350 tons of structural material, which will be required for the new station to be erected on the South Side, Pittsburg, in the near future. The contract has not yet been let for the building to the Schultz Bridge & Iron Co., or to any other concern, and no prices are mentioned in the orders placed for the structural material, these being early placed to ensure that the material can be had at the time desired.

Power Equipment and Machine Tools.

The Harrison Safety Boiler Works, of Philadelphia, report the following recent sales of their well known Cochrane Separators: Pejepscot Paper Co., Pejepscot Mills, Me., 10-inch horizontal; J. D. McRae & Bro., Chicago, 4-inch horizontal; Empire State Dairy Co., Brooklyn, N. Y., 4-inch horizontal; Nutter & Seabury, Boston, 8-inch horizontal; Estey Organ Co., Brattleboro, Vt., 8-inch horizontal; Warner Bros. Chicago, 4-inch horizontal; La Compagnie Generale Glace Hygienique, Paris, France, 6-inch horizontal; Atlas Cement Co., Northampton, Pa., 4-inch horizontal; United Shirt & Collar Co., Troy, N. Y., 6-inch horizontal; Nonessen, Pa., Steel Co., two 5-inch and one 6 inch and one 8-inch vertical, also 6-inch horizontal; Dover Iron Co., of N. J., 8-inch horizontal; Dill & Collins, Philadelphia, 6-inch horizontal; Fergus Falls, Minn., State Hospital, 4-inch vertical; P. Cogan & Son. Stoneham, Mass., 4-inch horizontal; Walworth Construction & Supply Co., Boston, 5-inch horizontal; Massachusetts General Hospital, Boston, 14-inch horizontal; Delaware, Lackawanna & Western R. R. Co., 5-inch horizontal; Anglo-Swiss Condensed Milk Co., Cham, Switzerland, six 2-inch, one each 4-inch and 6-inch vertical, and one 6-inch horizontal; Illinois Steel Co., So. Chicago, two 8-inch horizontal; A. S. Hay, Yokohama, Japan, one each 1½-inch, 3-inch, 4-inch, 6-inch, 8-inch and two 2-inch horizontal, and one 4-inch vertical; U. S. Government, three 3-inch vertical; Sayles Bleacheries, Salesville, R. I., one each 6-inch, and 8-inch horizontal; Blackwell's Durham Tobacco Co., Durham, N. C., 3-inch horizontal; Reid, Murdock & Co., Chicago, 5-inch vertical, and 4-inch horizontal; Ball Engine Co., Erie, Pa., 4½-inch vertical; Humboldt Mfg. Co., Arcata, Cal., 4½-inch vertical; Crane Co., Chicago, 5-inch vertical; Fort Dodge, Iowa, Light & Power Co., 8-inch horizontal; Ferry Boat, No. 3, City of Boston, 4-inch horizontal; Eastern Ry., of Minnesota, to 6-inch vertical, and one 6-inch horizontal; Fred. W. Wolf Co., Lake Charles, Ind., 4½-inch horizontal; Lorain Steel Co., Lorain, O., one 6-inch and three 8-inch horizontal; August Kern Barber Supply Co., St. Louis, Mo., 5-inch horizontal; Board of Light & Water Commissioners, Milford, Del., two 4-inch vertical; Listie Mining & Mfg. Co., Somerset, Pa., 8-inch horizontal and one 2-inch horizontal; Western Pennsylvania Penitentiary, Allegheny, Pa., two 6-inch horizontal; Fraser & Chalmers, Inc., New York City, 12-inch horizontal and 8-inch vertical; Supreme Court Building, New York, 6-inch vertical; Mound City Paint & Color Co., St. Louis, 4½-inch horizontal; Cambria Steel Co., Johnstown, Pa., 12-inch horizontal; Cleveland, O., Rolling Mill Co., 8-inch horizontal; G. M. Parks, Fitchburg, Mass., 6-inch vertical; Homestead Steel Works, Munhall, Pa., 20-inch angle; Boston Elevated Ry. Co., Boston, three 24-inch horizontal; Atlantic Refining Co., Philadelphia, 6-inch Oil Ammonia; Webster, Mass., Electric Co., 5-inch horizontal; Ajax Forge Co., Chicago, 6-inch horizontal; Reilly & Peyton, Philadelphia, 5-inch horizontal; Western Brewing Co., Belleville, Ill., 4-inch horizontal; Manhattan Hygeia Ice Co., New York, 5-inch Oil-Ammonia; American Blower Co., London, England, 6-inch horizontal; Glenlyon Dye Works, Saylesville, R. I., two 6-inch horizontal; Cochrane Chemical Co., Everett, Mass., 6-inch horizontal; Barnhart Bros. & Spindler, Chicago, 6-inch horizontal; Stanley Rule & Level Co., New Britain, Conn., 3½-inch horizontal; Union Iron & Steel Co., Youngstown, O., 16 inch horizontal; Lehigh Portland Cement Co., Ormrod, Pa., 4-inch horizontal; Jamaica, L. I., Ice & Cold Storage Co., 8-inch horizontal; A. I. Root Co., Medina, O., 8-inch horizontal: Shaw, Cassils & Co., Huntsville, Ontario, two each 5 inch and 3 inch vertical; Philadelphia & Reading Ry. Co., Reading Terminal, Philadelphia, two 6-inch horizontal; Hunter & Dickson,

A COCHRANE RECEIVER SEPARATOR GIVES LARGE STEAM STORAGE CAPACITY, STEADYING THE FLOW WHERE THE LOAD IS VARIABLE OR THE PIPES ARE SMALL, OBVIATING "HAMMER" IN THE MAIN, AND PROVIDING FOR SUDDEN FLUSHES OF WATER. THE ONE ILLUSTRATED HEREWITH IS AN 18-INCH HORZ. "COCHRANE" WHICH WE RECENTLY BUILT FOR THE LORAIN STEEL CO.

SKEPTICAL ABOUT OIL? DON'T BE.

Purifying exhaust steam from cylinder oil is the particular and precise service which our COCHRANE OIL SEPARATORS can accomplish. No uncertainty—just their every-day duty.

You've heard of the COCHRANE HEATERS? They're of the **open** type, and every one of them has a Cochrane Oil Separator forming part of it. What are these Heaters doing for steam users? Giving them the full advantage of exhaust steam for heating and purifying boiler feed water. Saving the exhaust condensed in heating the water. Keeping boilers clean. Keeping oil out of them. Without these Oil Separators these heaters would never have been known. Now both are known—**favorably known**—if 1,500 of the Separators, and hundreds of thousands of H. P. of the heaters in **most** satisfactory service means anything.

Do you want a Separator or a Heater?
We would like to tell you about our
"COCHRANES."

HARRISON SAFETY BOILER WORKS,

Clearfield and 17th Sts., Philadelphia, Pa.

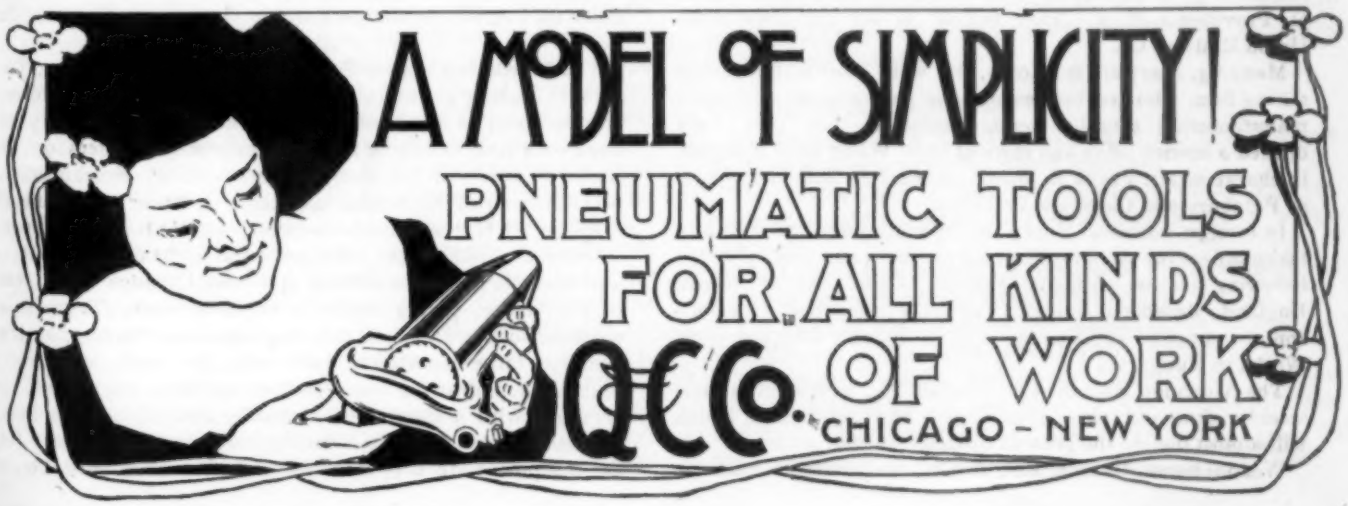
Philadelphia, 4-inch vertical; Martin Velvet Co., Norwich, Conn., 5-inch horizontal; Chicago, Ill., Dock Co., 6-inch vertical; Verlenden Bros., Darby, Pa., 7-inch vertical; Alabama Brewing Co., Birmingham, Ala., 5-inch Oil-Ammonia; C. H. Dexter & Sons, Windsor Locks, Conn., 4-inch horizontal; Duquesne Furnaces, Cochrane Station, Pa., two 14-inch angle; Alabama Ship Building & Dry Dock Co., Birmingham, Ala., 16-inch angle; Ohio Steel Co., Youngstown, O., three 14-inch horizontal; Parke & Lacy Co., one each 1-inch, 3½-inch and 4-inch horizontal; Q & C Co., Chicago, 4-inch vertical.

C. A Dielhenn, who has been Cleveland sales agent for two years for the Medart Pulley Co., leased a short time ago a building at Long and South Water sts., having four floors and a basement, and giving in all 13,000 square feet of floor space. This extension of facilities was in view of growing business and the plan of the company to make Cleveland the shipping point for Central territory. A large stock is now carried in the Cleveland building, and it will be drawn on to supply the trade in Northern Indiana, Michigan, Northern Ohio, Western Pennsylvania and Western New York. A complete line of power transmission equipment is carried, including steel rim and cast iron pulleys, hangers, couplings, pillow blocks, etc. Specifications and estimates will be furnished on power equipment and contracts taken to erect rope and gear transmission machinery.

The Southwark Foundry & Machine Co., of Philadelphia, writes us in view of the comment and inquiry occasioned by the breaking of a fly-wheel on an engine built by it for the Lackawanna Iron & Steel Co., Scranton, Pa. The company asks that the statement be made that while it built the engine it did not furnish the fly-wheel, the Lackawanna company making use of an old one.

E. H. Hargrave, president of the Cincinnati Tool Co., has just sailed from New York on a six months' business tour, most of which will take in South American points.

The Filer & Stowell Manufacturing Co., of Milwaukee, Wis., has received orders for 10 large engines for Canada and Mexico and is hard pressed to attend to its domestic business. Eight go to the sugar plants of Mexico and two to Canada.



MOUNT SAVAGE FIRE BRICK.

UNION MINING CO,

Proprietors of the CELEBRATED Mount Savage Fire Brick

GOVERNMENT ‡ STANDARD.

Established 1841. Capacity, 60,000 Per Day; 18,000,000 Per Year.

The First Manufactory of its Kind in the U. S.

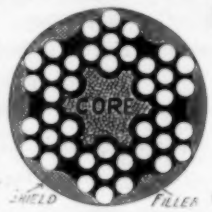
Home Office and Works:—**MOUNT SAVAGE, Alleganv County, Md.**

Branch Offices:—No. 1 Broadway, New York, N. Y.; No. 222 So. Third St., Philadelphia, Pa.; Ferguson Block, Pittsburgh Pa., Stowe, Fuller & Co., 249 Arcade, Cleveland, Ohio.

THE RIVERSIDE FOUNDRY CO., Cleveland, O.

Rolling Mill, Rod Mill, Wire Mill and Blast Furnace CASTINGS of Every Description.

CHILLED AND HARD GUIDES A SPECIALTY.



PRESERVE YOUR Wire Ropes, Manilla Ropes, Gearing.

Catalogue L tells how.

THE IRONSIDES COMPANY, COLUMBUS, O., U. S. A.

When writing to advertisers, kindly mention this paper.

OTIS STEEL

"OTIS" FIRE-BOX PLATES A SPECIALTY.

Flange Plates, Ship Plates, Tank Plates, Steel Car Axles and Forgings of all kinds.

Steel Castings from 100 to 75,000 lbs.

Head Office and Works, CLEVELAND, OHIO.

Agencies: NEW YORK, 97 Cedar St. CHICAGO, Old Colony Bldg.
ST. LOUIS, 516 N. Third St. WASHINGTON, Kellogg Bldg.
MONTREAL, Homer Taylor, 183 St. James St.
SAN FRANCISCO, John Woodlock, 154-156 First St.

Conestoga Building. EDWARD E. ERIKSON, PITTSBURG, PA.

Regenerative Gas Furnaces and Water Seal Gas Producers.

Producer Gas under Tubular Boilers, saving 20 per cent in fuel. NO SMOKE.

The A B C of Iron, Now 81.

WANTED!

First class body maker, steady work.

WILLOUGHBY-OWEN CO.,
UTICA, N. Y.

FIRE BRICK.

BRANDS:
O. K. CROWN.
O. K.
A.

SUITABLE FOR
Furnace, Malleable, Mill, Foundry and Lime Kiln Work.

OAK HILL FIRE BRICK AND COAL CO.,
OAK HILL, OHIO.

Besides, the company has an order for a 6,000 h. p. Corliss engine to go to the seat of the original Corliss engine works at Providence, R. I. This engine is for the Providence Union Railway Co.

Manning, Maxwell & Moore, the well known machinery selling firm, who are interested also in several machinery manufacturing establishments, announce that they have opened a branch office and store at 26 S. Water st., Cleveland, in charge of Mr. Frank B. Ward. Robert A. Bole is manager of Pittsburg and Cleveland branches.

In foreign business, Henry R. Worthington has recently taken orders for pumping engines for the water supply of the following places: Amiens, France; Ryde, Isle of Wight, England; Besancon, France; Verrins, France, besides a horizontal compound condensing engine for the Disgyor Steel Works in Hungary.

The Shenango Machine Co., Sharon, Pa., will erect a new steel building and intsall considerable new equipment, which will almost double the present capacity of their plant.

Westinghouse, Church, Kerr & Co., are about to make a large shipment of compound engines to the Dudley Corporation, Staffordshire, Eng. They have just received a large order for engines for the Compagnie Generale de Traction de Paris.

The Toledo Machine & Tool Co., 1736 to 1744 Dorr st., Toledo, O., is now getting nicely settled in its new plant, formerly occupied by the Yost Mfg. Co., finding it necessary to work over-time to handle the large amount of orders on its books. Officers of the company are: E. P. Breckinridge, president; Graff M. Acklin, secretary, treasurer and general manager; J. G. Robinson, vice-president; H. J. Hinde, superintendent. The plant situated on the L. S. & M. S. Ry., and near the Michigan Central Railroad, includes 40,000 feet of floor space, giving employment to 80 men. There is a machine shop 76x163 feet, erecting room, 29x162 feet; a very complete forge department, tool room, die room, 76x76 feet, pattern shop, drafting room, storage and shipping rooms, all arranged with a view of economically and rapidly handling the several lines of work. Among new tools purchased for the equipment are a 15-ton crane from the Case Mfg. Co., a

U. BAIRD MACHINERY CO.,

423-425 Water St., **PITTSBURG, PA.,** 124-126 First Ave.

Machine Tools and Supplies. Send for list of Second-hand Tools.

P & B

PAINT

The best preservative for IRON AND WOOD work exposed to moisture or the actions of acids, alkalies, coal-gas, etc. Contains no oil or tar. Is durable, penetrating and elastic. Of special value for coating roofs, stacks, tanks, vats, etc.....

Write for prices and further particulars.

THE STANDARD PAINT COMPANY

SOLE MANUFACTURERS

NEW YORK: 81-83 John Street
CHICAGO: 189 Fifth Avenue

McDOWELL

SEMI-STEEL

PROCESS.

(Cupola metal.) Government tests 36,000 to 49,000 tens. strength.

HANSON McDOWELL,
1522 Monadnock. Chicago.

FOR SALE.

One 22 x 42 in. Wright Corliss Engine. Band wheel, 16 ft. x 36 in.

This engine is in first class order, and will be sold at a very reasonable price.

CRANE CO., Chicago.

KENTUCKY FIRE BRICK WORKS'

CUPOLA BRICK.

KENTUCKY FIRE BRICK WORKS, PORTSMOUTH, O. HIGH GRADE FIRE BRICK BEST BLAST FURNACE & ROLLING MILL BRICK

STEEL WORKS BRICK.

FIREBRICK, KY.

A firm needing a certain line of goods naturally turns first to those it has seen oftenest advertised, and with whose name it thus has become familiar. "Keeping everlastingly at it brings success."

SHENANGO VALLEY STEEL CO., New Castle, Pa.,

MANUFACTURERS OF

Tin Plate Bars, Steel Billets, Blooms and Bessemer Pig Iron.

Bickford universal radial drill, 6 feet; 20 h. p. Bullock electric motor; milling machines of the Becker, Cincinnati and Garvin types and a 1,500-lb. steam hammer from Bement, Miles & Co. The regular line of product consists of blanking, stamping and embossing machines, perforating and trimming presses, double acting cutting and drawing presses, reducing presses, power drop hammers, squaring shears, and dies and special tools. A new drawing press will be ready for the market within a few weeks. Recent completed work includes a plant for the Day-Ward Co., Warren, O., for manufacturing copper-lined and enamel bath tubs, one machine being a heavy embossing and stamping press, weighing 10 tons, of special grade of steel, exerting a pressure of 250 tons. Plants for manufacturing steel ranges have been furnished the Champion Steel Range Co., of Cleveland; the Eclipse Stove Co., of Mansfield, and the Toledo Stove Co., of Toledo; also a steel press for the Born Mfg. & Stove Co., of Cleveland. An automatic planishing machine with 8x22 ft. cylinder, feeding in both directions, is now ready for shipment to the Day-Ward Co., Warren, O. Besides the domestic trade, a considerable line of export trade in power presses is carried on.

The Danielson Machine & Tool Co., recently incorporated, is now engaged in moving its outfit of machines, tools and stock from Toledo, O., to Cleveland, where it will operate in the plant formerly occupied by the Berner-Mayer Co., on Lake st., near Bank st. The officers of the company are G. F. Danielson, president; formerly of the Toledo Machine & Tool Co., of Toledo; G. A. Kaercher, secretary and treasurer, of Cleveland, and M. A. Possons, vice-president, of Cleveland. The company will manufcture a line of high class die and tool work and operate a general machine shop. It will act as agent for the E. W. Bliss Co. presses, the Garvin Machine Co. machine tools, and carry in addition a line of select second-hand machinery. It is expected that the plant will be in operation about April 1.

The boiler works at Greensburg, Pa., will be removed to Mannington, W. Va. The business will be incorporated under the name of the West Virginia Boiler & Machine Works, with a paid-up capital of $25,000. The stockholders are R. D. Sheppard, J. C. Sheppard, S. F. Maxwell, F. W. Chichester, and H. E. Marker, all of Greensburg.

Contracts for machinery for the plant of the R. D. Nuttal Co., Allegheny, have been placed in the east. The additional equipment will consist principally of large automatic gear-cutting machines.

General Industrial Notes:—

The Carnegie Steel Co., Ltd., will start up its Douglass Furnace at Sharpsville, Pa., about April 15.

The Dayton Coal & Iron Co., operating mines and two furnaces at Dayton, Tenn., will advance the wages of miners 7 per cent.

The Lukens Iron & Steel Co., Coatesille, Pa., have increased wages 10 per cent, to take effect April 1.

The shafting department of the Mahoning Valley Iron Co., Youngstown, O., has been on double turn recently.

Sharpsville Furnace, Sharpsville, Pa., was blown in last week after being out for two years. The output has been sold to July 1. The Central Iron & Steel Works, Harrisburg, Pa., has given notice of a wage advance, to take effect April 1.

The Iron Founder Supplement.

A complete illustrated exposition of the art of casting in iron, comprising the erection an dmanagement of cupolas, reverberatory furnaces, blowers, dams, ladles, etc., mixing cast iron, founding of chilled car wheels, malleable iron castings, foundry equipments and appliances, gear molding machines, molding machines, burning, chilling, softening, annealing, pouring and feeding, foundry materials, advanced molding, measurement of castings, wrought iron, steel, etc. Also the founding of statues, the art of taking casts, pattern modeling, useful formulas and tables. By SIMPSON BOLLAND. Illustrated with over 200 engravings; 400 pages; 12mo; cloth $2.50

Sent postpaid on receipt of price by

The Iron Trade Review Co.,

CHICAGO. CLEVELAND. PITTSBURG

"It is true that advertising will not put merit into poor merchandise, but good merchandise often becomes poor for the want of good advertising."

—Some Essential Oils for Advertisers

...A B C OF IRON...

A book for foundrymen. It is issued in cloth binding, and gives much valuable matter on how to reduce cost of mixtures, and on grading and numbering of pig iron.

CHAPTER HEADINGS:—Iron—What is it? Pig Iron. Constituents of Iron. Numbering of Pig Iron. Grading of Iron. How to reduce cost of mixture. Steel Physical Properties of Metals Defined. Statistics. Early History and Manufacture of Iron.

Former Price, $2.00. NOW $1.00.

Sent, postpaid, on receipt of price, by

THE IRON TRADE REVIEW CO.,

CHICAGO. CLEVELAND. PITTSBURG

IT PAYS

To advertise in the Iron Trade Review.

METHODS FOR THE ANALYSIS

— OF —

ORES, PIG IRON and STEEL

IN USE AT THE

Laboratories of Iron and Steel Works in the Region about Pittsburg, Pa.

Together with an Appendix containing various special methods of analysis of ores and furnace products.

Contributed by the Chemists in charge, and edited by a Committee of the Chemical Section, Engineers' Society of Western Pennsylvania.

Bound in Cloth, - - - - $1.00
Bound in Paper, - - - - .75

THE IRON TRADE REVIEW CO., Chicago, Cleveland, Pittsburg.

"Metallurgy of Cast Iron,"

By THOS. D. WEST; 107 engravings, 583 pages. Just issued. A valuable work to Founder, Molder, Draughtsman, Designer, Technical School Specialist. Chemistry of Iron; cheaping of mixtures; the effect of the metalloids in changing the grade of iron; latest improvements in cupola construction and practice—all are fully covered. Price $3. Sent postpaid on receipt of price, by *The Iron Trade Review Co.*, Cleveland, Ohio; 1522 Monadnock Block, Chicago, Ill.

James M. Swank, author of "Iron in All Ages," and editor of the *Bulletin* of The American Iron & Steel Association, in reviewing "Metallurgy of Cast Iron," says it is "One of the most valuable publications relating to the manufacture of iron castings, that has ever, to our knowledge, been issued in this or any other country."

DIRECTORY

OF

Iron and Steel Works of United States,

Published by The American Iron and Steel Association.

PRICE, $7.00. MAY BE ORDERED THROUGH

IRON TRADE REVIEW,

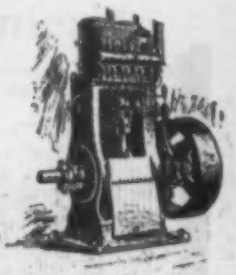
Offices: Pittsburg, Cleveland, Chicago.

The Iron Trade Review is an increasingly valuable medium through which to sell equipments to machine shop and foundries.

STURTEVANT ENGINES

AND

GENERATORS.



Blowers,
Exhaust Fans,
Forges,
Steam Traps,
Steam Fans,
Heating
and
Drying
Apparatus,
etc., etc.

BUILT FOR DIRECT OR BELT CONNECTION.

5 TO 100 HORSE POWER.

Vertical and Horizontal,
Single and Double,
Simple and Compound.

SEND FOR CATALOGUE No. 18.

B. F. STURTEVANT CO.,

WORKS, BOSTON, MASS.

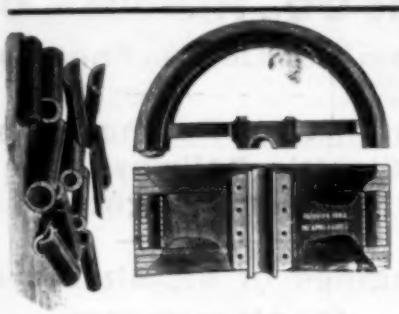
WAREROOMS:

34 Oliver Street, - Boston.
131 Liberty Street, - New York.
16 South Canal Street, Chicago.
135 North Third Street, Philadelphia.
75 Queen Victoria Street, London.
21 West Nile " Glasgow.
4 Neue Promenade " Berlin.
2 Kungsholmstorg " Stockholm.

DODGE MAN'F'G. CO.

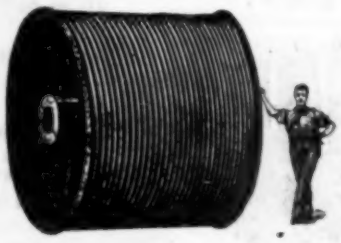
ENGINEERS, FOUNDERS and MACHINISTS.

AMERICAN SYSTEM ROPE TRANSMISSION.

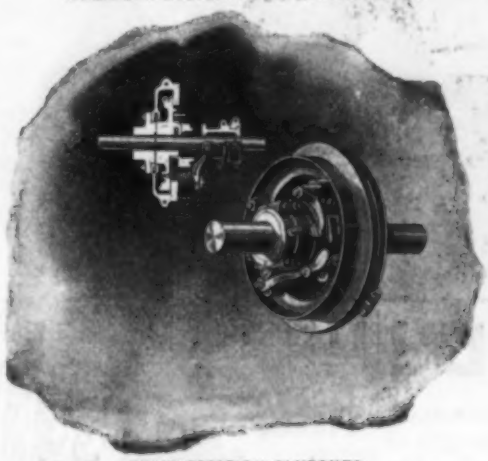


INDEPENDENCE WOOD SPLIT PULLEYS.

GRAIN ELEVATOR MACHINERY,
MILL SUPPLIES.



ROPE WHEELS.



SPLIT FRICTION CLUTCHES.

COMPLETE ESTIMATES FURNISHED.

Mishawaka, Ind.

Branch Houses— New York, Boston, Chicago.

IRON CENTER, WOOD RIM DYNAMO PULLEYS.

BREWERY MACHINERY.

SPROCKETS.

The Encyclopedia of Founding and Dictionary of Foundry Terms

Used in the practice of molding. Together with a description of the tools, mechanical appliances, materials, and methods employed to produce castings in all the useful metals and their alloys, including brass, bronze, steel, bell, iron and type founding, with many original mixtures of recognized value in the mechanic arts. Also aluminum, plating, gilding, silvering, dipping, lacquering, staining, bronzing, tinning, galvanizing, britannia ware, German silver, nickel, soldering, brazing, ores, smelting, refining, assaying, etc. By SIMPSON BOLLAND, author of "The Iron Founder," "The Iron Founder Supplement." 12mo.; cloth; sent postpaid on receipt of price, ... $3.00

THE IRON TRADE REVIEW CO., Chicago. Cleveland, Pittsburg.

Compare

A well made cut gear with the best gear you can procure having cast teeth, caliper them and note the difference; then put them in service together and watch results. We think you will never buy another cast gear, they are so different.

We make only cut gears, bevel or spur.

R. D. NUTTALL COMPANY,
Allegheny, Pa.

Gears and Pinions

SPUR GEARS,
SPIRAL GEARS,
BEVEL GEARS,
WORMS and RACKS.

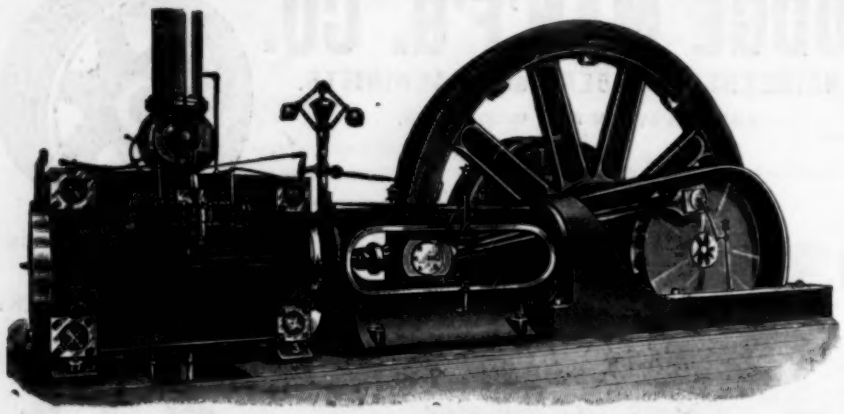
We make Gears of Steel, Malleable Iron, Cast Iron, Brass and Rawhide, and furnish them complete or cut as desired.

Gear Cutting of all Descriptions.

Material and workmanship the best.
Write us for estimates and prices.

THE VAN DORN & DUTTON CO.,
1796 East Madison Ave., Cleveland, Ohio.

THE HOOVEN, OWENS & RENTSCHLER CO., Hamilton, O.



Hamilton Corliss Engines.

Engines for Rolling Mills
Electric Railways and
Electric Light.

Engines of all Sizes and
for all purposes.

46 South Canal St., CHICAGO.
39 and 41 Cortlandt St., NEW YORK.
Lewis Block, PITTSBURGH, PA.
Room A, Laclede Building, ST. LOUIS, MO.
C C. MOORE & CO., SAN FRANCISCO. CAL.

WANTED!

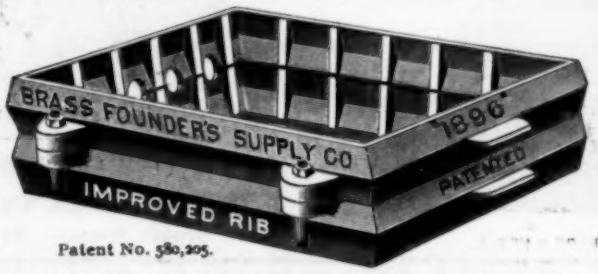
By an engineer and manufacturer in general engineering work, a position as manager of works, or would like to join a new enterprise of engineering and founding; can introduce desirable lines of specialties; has extensive experience in all departments. Address

ORIGINATOR,
Care Iron Trade Review, Cleveland, O.

B.F.S.Co's
Flasks
are
All Right
so
Are Prices.

Send for catalogue if interested.

LATEST AND BEST.



Patent No. 580,205.

BE SURE YOU GET THE RIB.

BRASS FOUNDERS' SUPPLY CO., Newark, N. J.

Selling Agents
FOR
Brass Founders Supply Co.:
THE
S. Obermayer Co.
Cincinnati and Chicago.
J. W. Paxson Co.
Philadelphia, Pa.
J. S. McCormick Co.
Pittsburgh, Pa.

Larger paid circulation and larger list of advertising patrons than ever in its history. These THE IRON TRADE REVIEW now has. Advertising in it pays.

BRASS FOUNDERS FINISHERS J. J. RYAN & CO.
6874 West Monroe St., Chicago.
Best Bronze, Babbitt Metals, Brass and Aluminum CASTINGS On Short Notice.

Do You Want an---

Automatic Machine Built?

Or any kind of Wire or Sheet Metal Machinery built? If so, write

A. H. NILSON MACHINE CO.,
Bridgeport, Conn.

WE NEEDED

MORE ROOM

For increased Trade and Stock and have added No. 8 South Water St. to our salesrooms.

Cleveland Tool & Supply Co.

Punches, Dies, Metal Stamping

IN

STEEL, BRASS, COPPER, ALUMINUM, GERMAN SILVER, ETC.

Send sample or sketch for prices. Novelties and patented articles made by contract.

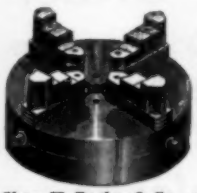
E. KONIGSLOW & BRO.,
310-312 Seneca St., Cleveland, O.

MACHINERY FOR REDUCING AND POINTING **WIRE**

By Compression or Cold Swaging.

Especially adapted to Pointing Wire Rods and Wire for Drawing. For machines or information, address

S. W. GOODYEAR.
Waterbury, Conn



SKINNER CHUCKS.

Independent and Universal Chucks, Combination Lathe Chucks, with pt. reversible jaws, Drill Chucks, Planer Chucks and Face Plate Jaws.
Send for Catalogue.

SKINNER CHUCK CO.
New Britain, Conn.

Chas. H. Besley & Co., 10 N. Canal St., Chicago, Ill.

---

7 FT. PLANER.

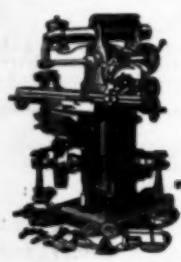
Second Hand.

Planes 84-inch x 84-inch x 18 ft., weight, 35,000 lbs.

New 66-in. planer for delivery in April.
New 36-in. planers for delivery 30 days.
Write for full particulars to

Marshall & Huschart Machinery Co.,

19 South Water St., Cleveland, Ohio.
62-64 South Canal St. Chicago, Ill.



Brainard Milling Machine Co.

WORKS AT
HYDE PARK, MASS.

THE
W. M. Pattison Supply Co.
277-287 St. Clair St.,
Agents for Cleveland and vicinity.

A large and growing circulation among machine shop and foundry firms, has

THE IRON TRADE REVIEW.

Are You Booming Arnica?

We all remember the old way of riveting with the hand hammer; and when you hurried it was a frequent thing to pound your fingers—then kuss words and arnica, and, of course, the work was *resting*. It made good candidates for revivalists, but commercially was a failure. The new way is to use our **Elastic Blow Riveter**—one thousand blows per minute and every one in the right spot. You can easily see the saving. Some manufacturers use forty of them. They beat the arnica bottle for making money. Send for circular.

THE F. B. SHUSTER COMPANY,
Formerly JOHN ADT & SON, New Haven, Conn.

ARMSTRONG MAN'F'G. CO.

New York Office, 139 Center Street.

The well merited reputation attained by our goods is our guarantee of their superiority. If you cannot get them of your dealer send to us for catalogue and prices.

The A B C of Iron.

A book for foundrymen. It is issued in cloth binding, and gives much valuable matter on how to reduce cost of mixtures, and on grading and numbering of pig iron.

Former Price $2.00, NOW $1.00.

ORDER OF

THE IRON TRADE REVIEW, 27 Vincent St., Cleveland. O.

SHEET AND **BLACK PLATE BARS.**

All Sizes of **MERCHANT BAR.**

SOFT STEEL BARS
Light Rails, Hexagons, Channels, Angles, Tees & Special Shapes
BILLETS SHEETS TIN & TERNE PLATE
Black, Painted, Galvanized—Sheets, Plain and Formed.—Corrugated,—Crimped & other forms of ROOFING.

COMMON AND **SPECIAL SHEETS.**

Tin and Terne Plate In All Grades.

ÆTNA-STANDARD IRON & STEEL CO., Bridgeport, O.

THE BOURNE-FULLER CO.,

Pig and Bar Iron,

CLEVELAND, . OHIO.

Oglebay, Norton & Co.,
LAKE SUPERIOR IRON ORES.
— AGENTS —
The Spanish-American Iron Co.,
Santiago, Cuba.
CLEVELAND. PHILADELPHIA.

M. A. HANNA & CO.

IRON ORE,

PIG IRON AND COAL.

CLEVELAND, OHIO.

McKEEFREY & CO.,

PIG IRON,
COAL AND COKE.

LEETONIA, OHIO.

THE OHIO STEEL COMPANY,
MANUFACTURERS OF
Steel Rails, Billets,
Sheet and Tin Plate Bars,
YOUNGSTOWN, OHIO.

BERGER'S METAL CEILINGS

Deepest stamped. Most artistic. The only ones in Classified Designs. Write to-day for details. THE BERGER MFG. CO., Canton, O.

BECAUSE NOTHING BUT THE BEST MATERIAL IS USED "HONESTY IS THE BEST POLICY." TO MAKE GOOD CASTINGS, USE THE BEST IRONS.

CLINTON AND HECTOR

Inspected Foundry Irons
—FOR—
SOFTNESS, STRENGTH, FLUIDITY, UNIFORMITY.
MANUFACTURED BY
CLINTON IRON & STEEL CO.
FURNACES: Pittsburgh, Pa. NEW YORK OFFICE: No. 15 Cortlandt St.

CLEVELAND ROLLING MILL CO.,
CLEVELAND, - OHIO,
—MANUFACTURERS OF—
BESSEMER AND OPEN-HEARTH STEEL,
Blooms, Billets, and Slabs, Steel Rails, Steel Beams, Channels and Angles. Steel Forgings, Bar Spring, and Sleigh Shoe Steel. Steel Wire of all kinds. Barbed Wire, Iron and Steel Plates, Galvanized and Black Sheet Iron and Steel Corrugated Iron Roofing.

LAKE SUPERIOR CONSOLIDATED IRON MINES.

HIGH GRADE MISSABE ORES.

Adams, Ainslie, Duluth, Hibbing, Hartley, Linwood and Pillsbury Mines.
OGLEBAY, NORTON & CO., Sales Agents - Cleveland, Ohio.

E. A. DELANO,

50 to 52 So. Clinton St., Chicago.
MANUFACTURER OF
SHAFTING, PULLEYS & HANGERS.
A Large Stock Constantly on Hand.
CORRESPONDENCE SOLICITED.

J. J. MOREHOUSE, PRES'T & TREAS.

The Salisbury Carbonate Iron Co.

Suitable for CAR WHEELS, CARBON CHILLED ROLLS, MALLEABLE CASTINGS.

MANUFACTURERS OF
SUPERIOR QUALITY CHARCOAL
CARBONATE & SALISBURY
PIG IRON.
STRONGEST CAST IRON IN THE WORLD
FOR GUN IRON CASTINGS & GUN CARRIAGES.
OFFICE 93 & 95 NASSAU STREET, NEW YORK.

Made from ANEMIA & SHAKER HEMATITE & CALCINED CARBONATE ORES.

FURNACES: THE LANSDON, CHAPINVILLE, CONN. CHATHAM, CHATHAM, N. Y. COPAKE IRON WORKS, N. Y.

This Carbonate Iron is especially adapted and used largely in the manufacture of gun iron and gun castings for the U S. Navy. Government tests show the iron in the pig to stand from thirty-five thousand to forty-two thousand nine hundred pounds tensile strength. We solicit correspondence and full information.

THE 1898 EDITION
OF THE
Iron and Steel Directory

Published by
The American Iron and Steel Association.
Will be sent postpaid by *The Iron Trade Review* at **$7.** Ready now.

Is a thorough revision of the list of blast furnaces, rolling mills, Bessemer and Open-Hearth steel works, plate and sheet mills, nail mills, tin plate mills, malleable, cast iron pipe and wrought pipe works, car wheel and locomotive works, with many new lists of works in other lines.

FOR CAR WORK

and all malleable work there are no stronger or more satisfactory irons than

"Pioneer," "Antrim," "Elk Rapids"

LAKE SUPERIOR CHARCOAL IRON.

Superior Charcoal Iron Co.,

911, 912, 913 Michigan Trust Bldg.,

GRAND RAPIDS, MICH.

As we control its manufacture
Our steel, we know will never fracture.
And We our reputation stake
On every rivet that we make.
VICTOR BOILER RIVETS.
MANUFACTURED BY
CHAMPION RIVET CO. CLEVELAND
ARE THE BEST RIVETS MADE.

HEBER WELLS,
Pattern Letters.
For Iron and Brass Castings.
Various Sizes and Styles. . .
159 William St., New York.

ESTABLISHED 1854.

PETER GERLACH & CO.,

MAKERS OF

Saws, Tools and Machinery.

Office and Warerooms, 28 Columbus St.
Factories on Columbus, Winter and Leonard Sts.

Cleveland, Ohio, U. S. A.

PYROMETERS

Edward Brown,

ESTABLISHED 1860.

311 WALNUT St., PHILADELPHIA.

Manufacturer and Patentee

OF THE

Hot Blast (or Graphite) Pyrometer.—The only stationary Pyrometer now in use durable over 700 degrees.

The Standard Portable Pyrometer—For Blast Furnaces.

Mercury Revolution Indicator.—Centennial Exhibition Medal. Accurate for all time.

Annealing Oven Pyrometer—to 3,000 degrees—of 1893.

Tin-plating Pyrometer—of 1894.

Mercury and Steam Gauges.

"Metallurgy of Cast Iron,"

Price $3.

J. M. ALLEN, President.

WM. B. FRANKLIN, Vice-President.

F. B. ALLEN, Second Vice-President.

J. B. PIERCE, Secretary and Treas.

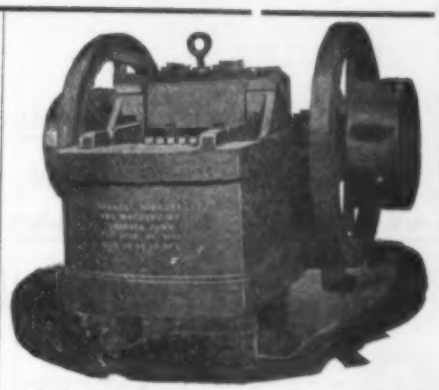
BURWELL & BRIGGS, General Agents, 32 and 33 Clark Bldg., 208 Superior St., Cleveland, O.

C. A. BURWELL, Chief Inspector, 32 and 33 Clark Bldg., 208 Superior St., Cleveland, O.

J. R. WOLCOTT, Special Agent, 32 and 33 Clark Bldg., 208 Superior St., Cleveland, O.

A large and growing circulation among machine shop and foundry firms has

THE IRON TRADE REVIEW.



THE FARREL (Blake Pattern (Ore and Rock.

- - - CRUSHER.

STANDARD OF THE WORLD.

Farrel Foundry and Machine Co.,

EARLE C. BACON, Engineer,

Havemeyer Bldg., **NEW YORK.**

Mines or prospects operated on contract to purchase, or under lease on fixed royalty or percentage, MONEY loaned, mines, MINING companies organized, their property exported, financed and managed; MINES, prospects, mineral lands, mining securities, contracts, bonds, stocks, leases and options bought and sold or negotiated; EXAMINE mines, prospects and mineral lands as to their value, method of working and condition of their titles. Assay and chemical work done.

EDW. N. BREITUNG, Marquette, Mich., U. S. A.

Cable address, Edbee. Codes, Lieber's Bedford, McNeil's, A B C Universal Commercial.

When writing to advertisers please mention The Iron Trade Review.

THE READING STANDARD BLOCK.

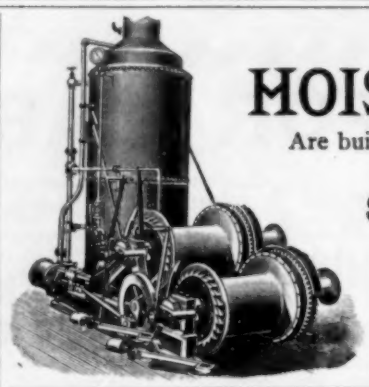
PATENTED.

This is the latest addition to our line of Chain Blocks. It is high in efficiency, has an adjustable automatic brake sustaining the load at any point of the lift, hoists and lowers rapidly, and being light and compact, can easily be taken from place to place.

TRAVELING CRANES, OVERHEAD TRACKS, ETC.

Reading Crane & Hoist Wks..

Reading, Pa.



LIDGERWOOD

HOISTING ENGINES

Are built to Gauge on the Duplicate Part System.

QUICK DELIVERY ASSURED.

STANDARD For Quality and Duty.

Steam and Electric HOISTS.

LIDGERWOOD MFG. CO.,

96 LIBERTY STREET, NEW YORK.

Chicago, Portland, Ore. Cleveland, Boston, Philadelphia, New Orleans.

LINK-BELT . .

Elevators and Conveyors,

Malleable Buckets, Steel Ash Cars, Shafting, Pulleys, Bearing, Rope Sheaves, etc.,

Link-Belt Machinery Co.

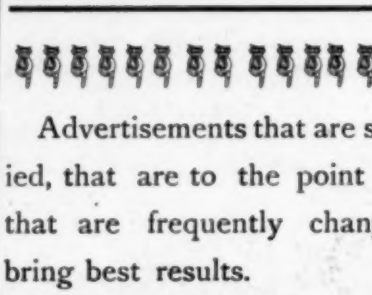
Engineers, Founders, Machinists. . . .

CHICAGO, U. S. A.

Link-Belt Engineering Co.

Phila. and New York.

The Chemical Analysis of Iron, $4.00.



THE BUCYRUS COMPANY,

DESIGNERS AND BUILDERS OF

Dredges, Steam Shovels, Excavating Machinery, Steam and Electric and Locomotive Cranes, Centrifugal Pumps, with Simple, Compound or Triple Expansion Engines, Pile Drivers, Wrecking Cars, Placer Mining Machines.

SOUTH MILWAUKEE, WIS.

Advertisements that are studied, that are to the point and that are frequently changed, bring best results.

Pittsburg Portable Forges.

Powerful Continuous Blast for bridge builders, boiler makers, structural iron workers, contractors and for general light blacksmithing.

Write for special catalogue and price list.

VULCAN MFG. CO., Ltd.,

Station D. Pittsburg, Pa.

CRANES • HIGH • SPEEDS • ELECTRIC • STEAM • HAND •

• MACHINERY • FOR HANDLING **COAL** AND **ORE** WORKS

THE BROWN HOISTING AND CONVEYING MACHINE CO CLEVELAND, O.

NEW YORK 26 CORTLANDT ST • LONDON 39 VICTORIA ST. S.W.

BILLET AND SLAB CONVEYORS,

BAR IRON CONVEYORS,

MECHANICAL BOSHES.

Complete plants designed and erected with guaranteed results.

Labor-Saving Devices and Conveying Machinery of All Kinds.

HEYL & PATTERSON, Pittsburg, Pa. **Office: 108 Market St.**

FOUR-NIGHT.

Cleveland Union Station.

Pennsylvania Lines.

Foot of Bank Street.

TICKET OFFICES at Station, Euclid Av., Woodland Av., and Woddell House corner.

THROUGH TRAINS RUN AS FOLLOWS BY CENTRAL TIME

*Daily. †Daily except Sunday.

xDaily except Saturday. ‡Saturdays only.

FROM CLEVELAND TO	LEAVE	ARRIVE
Pittsburgh and Bellaire	† 7:00 am	†12:10 pm
Salem and Pittsburg	* 8:00 am	* 8:30 pm
Pittsburgh, Bellaire and East	† 3:15 pm	† 6:25 pm
Philadelphia and New York	* 2:10 pm	*11:30 am
Baltimore and Washington	* 2:10 pm	*11:30 am
Alliance and Pittsburgh	* 2:10 pm	*11:30 am
Ravenna and Alliance	* 5:00 pm	* 8:45 am
Philadelphia and New York	*11:10 pm	* 4:30 am
Baltimore and Washington	*11:10 pm	* 4:30 am
Alliance and Pittsburgh	*11:10 pm	* 4:30 am

Mt. Vernon and Pan-Handle Route

FROM CLEVELAND TO	LEAVE	ARRIVE
Columbus and Cincinnati	* 8:35 am	* 5:40 pm
Indianapolis and St. L.	* 8:35 am	* 5:40 pm
Millersburg and Akron	† 3:15 pm	†12:10 pm
Col., Cin., Ind. & St. L.	x7:40 pm	*7:30 am
Col., Cin., Ind. & St. L.	‡11:20 pm	*7:30 am

BIG FOUR ROUTE

The Popular Line.

CHICAGO

TO

Indianapolis,

Cincinnati,

Louisville

AND ALL POINTS

SOUTH AND SOUTHEAST.

The scenic line to

WASHINGTON, via C. & O. Ry.

The direct line to ASHEVILLE, N. C.

J. C. TUCKER, G. N. A., 234 Clark St., CHICAGO.

HORSE AND MULE JEWELRY.

All tags and labels on genuine Covert Snaps, Webb Goods, Rope Goods and Chain Goods bear the above Trade Mark.

COVERT MFG. CO., West Troy, N.Y., U.S.A.

Press Clippings.

If you want THE BEST THINGS printed on any particular subject or ALL that is published about it everywhere, YOU CAN GET IT FROM US. Clippings mailed daily.

We read practically every newspaper and periodical that is published. Business men and others find our service very valuable to them. Rates, $1 per month and upwards.

Write for particulars.

The Chicago Press Clipping Bureau,

56 Fifth Avenue, CHICAGO.

PERFORATED METALS.

PERFORATED IRON, STEEL, COPPER, BRASS, TIN, ZINC, LEAD, ETC., TO ORDER.
LARGE AND VARIED ASSORTMENT OF SIZES. CORRESPONDENCE SOLICITED.
THE ROBERT AITCHISON.
PERFORATED METAL CO.,
OFFICE, ROOM 510 265 TO 269 DEARBORN STREET, CHICAGO, ILL. WORKS SOUTH CHICAGO.

STEEL CONSTRUCTION

IN ALL BRANCHES.

BUILDINGS DESIGNED AND ERECTED IN ALL PARTS OF THE WORLD.

Roof Frames and Trusses,
Blast Furnaces and Steel Works,
Cupolas, Ladles, Converters,
Boilers, Tanks and Heavy Plate Work

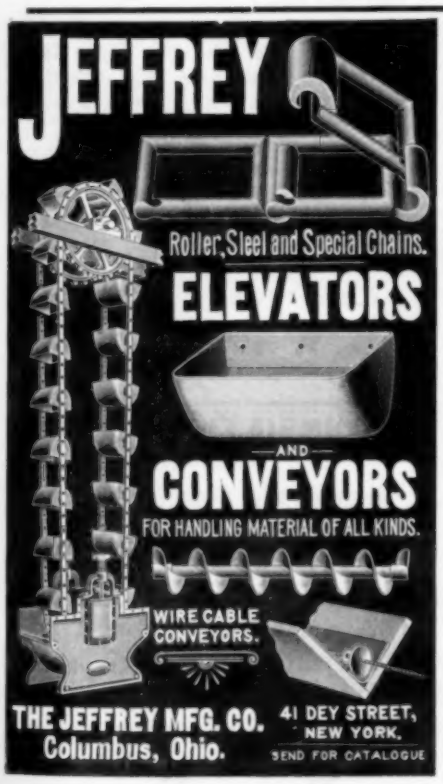
RITER-CONLEY MFG. CO., PITTSBURG, PA.

The Iron Founder.

A comprehensive treatise on the art of molding, including chapters on core making, loam, dry sand and green sand molding; also crystallization, shrinkage and contraction of cast iron, and a full explanation of the science of pressures in molds, added to which are formulas for mixtures of iron, tables, rules, and miscellaneous information. By Simpson Bolland. Illustrated with over 300 engravings. 12mo.; cloth,..... $2.50

SENT POSTPAID ON RECEIPT OF PRICE BY

THE IRON TRADE REVIEW CO., Chicago, Cleveland, Pittsburg.



SHIFFLER BRIDGE COMPANY,

BUILDING DEPARTMENT.

SPECIALTIES: Steel and Iron Buildings for Rolling Mills, Tin Plate Plants, Steel Works, Foundries Factories, Roof Trusses, Girders, Columns, Beams, Corrugated Iron, Etc

Main Office and Works:
48th Street and A.V. Ry., PITTSBURG, PA

Branch Offices:
1214 Betz Building, Philadelphia, Pa.
45 Broadway, New York, N. Y.
228 Lumber Exchange, Minneapolis, Minn.
1243 Marquette Building, Chicago, Ill.

MAPS

FOR READY REFERENCE.

The Chicago, Milwaukee & St. Paul Railway Co. has just issued in convenient form, for household, library and school reference, an atlas of seven colored maps of the world, the United States and our new possessions in the Atlantic and Pacific Oceans, together with an amount of valuable information connected therewith—all up to date. This atlas will be sent free to any address on receipt of six (6) cents in postage.

Apply to Geo. H. Heafford, General Passenger Agent, Old Colony Bldg., Chicago.

Now Ready!

SECOND EDITION

OF

Chemical and Metallurgical

HANDBOOK

CONTAINING

Tables, Formulas and Information for the use of Chemists, Metallurgists and Mining Engineers.....

BY

J. H. CREMER, M. E.,

AND

G. A. BICKNELL, M. S.

EXTRACT FROM PREFACE:

In the preparation of the second edition of our Handbook, the general plan of the first edition has been followed, viz., to present in concise form such data and information as are useful to the chemist and metallurgist. Several tables of the first edition, which were of somewhat limited use, have been omitted, while more than one hundred pages of new matter have been added.

The methods for analysis of iron ore, iron and steel and for assaying have been given briefly, but perhaps as much in detail as is consistent with the general scope of the book. Several changes and additions to the Specific Gravity tables have been made by adoption of later and more accurate values.

In the notes on blast furnace practice have been outlined the more important theoretical and practical points, which, it is hoped, will be of some service to those interested in the manufacture of iron.

The hygrometric table gives the necessary information for determining the amount of moisture in air, a subject whose importance in metallurgical operations is being more fully recognized at present than heretofore. This table is new and is based on the most accurate data available at the present time.

The tables of weights and measures, United States and foreign, have been very much amplified, and the conversion tables for United States and metric weight and measures of the U. S. Coast and Geodetic Survey included, the latter being based on the legal standard for this country.

Numerous miscellaneous tables have been added, which, it is hoped, will be found of value

Seal Morocco, - - $3.00

Sent postpaid on receipt of price by

The Iron Trade Review Co.,

CHICAGO, CLEVELAND, PITTSBURG.

THE "CLEARFIELD" FIRE BRICK
MANUFACTURED BY
THE CLEARFIELD FIRE BRICK CO., Limited
Office and Works at CLEARFIELD, PA.
Room 305 Ferguson Bldg., Pittsburg, Pa., John Richardson, Agent.

FIRE DOVER FIRE BRICK CO., MANUFACTURERS OF Furnace, Kiln and Special Shape Fire Brick. Office, 44 Mercantile Bank Bldg., CLEVELAND, OHIO. **BRICK**

FIRE BRICK For All Purposes.
CHICAGO FIRE CLAY PRODUCT CO.,
518 Chamber of Commerce, CHICAGO, ILL.

ÆTNA FIRE BRICK COMPANY,
Manufacturers of the Celebrated
ÆTNA HIGH GRADE FIRE BRICK,
Office and Works: OAK HILL, OHIO.

FOUNDRY MOLDING ...MACHINES...
Stripping Plate Machines Operated by Steam or Compressed Air.
Our new air power vibrator machine gives all the advantages of stripping plate work, without the cost of stripping plates.
Write us about low cost of pattern installation. Wood or metal patterns used.
THE TABOR MFG. CO., Elizabeth, N. J.

Millett's Patent Portable
Core Oven
All complete and ready to put the fire in.
No one who makes small cores can afford to be without it. . .
DOUBLE DOORS.
One closing the oven when the other is open.
Saves Fuel, Saves Time.
Send for Circular.
MILLETT CORE OVEN CO., Brightwood, Mass.
The Core Ovens may be seen in the sample rooms of The S. Obermayer Co., either in Cincinnati or Chicago. J. W. Paxson & Co., Philadelphia, Pa.

FIRE BRICK
Holmes, Strachan & Co.,
Manufacturers and Shippers
Steel
Savage Mountain
Holmes
Best made for Malleable Rolling Mill Furnaces and Cupola Linings.
DETROIT, MICH.

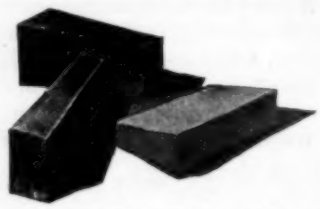
Persistence in Advertising

Is one of the requisites of satisfactory results. In the expansion of business which is confidently expected in the United States in the very near future, advertisers who have made themselves regularly prominent in the past two years will be first to reap the rewards of persistent publicity.

THE
S. OBERMAYER COMPANY, Cincinnati, O. Chicago, Ill. Larimer, Pa.
MANUFACTURERS OF
Foundry Facings,
Foundry Supplies,
Foundry Equipments.
IMPORTERS AND REFINERS
East India Plumbago, Silver Leads and Graphite.
Estimates given on complete Brass & Iron Foundries. Send for Catalogue No. 26.

SILICA BRICK
For Iron and Steel Furnaces, Glass Furnaces, etc.
SPECIAL SHAPES MADE TO ORDER.
DIAMOND FIRE BRICK WORKS.
AKRON, OHIO.

Fire Brick, Cupola Blocks, Molding Sand and General Foundry Supplies
OF THE HIGHEST GRADE ONLY



THE GARDEN CITY SAND CO.,
1201-1202-1203 Security Bldg., Chicago.

"Royal Star" and "Scioto Star"
High Grade FIRE BRICK.
Best for Rolling Mills, Blast Furnaces, Foundries, etc. High grade Plastic and Flint Clays for all refractory purposes at favorable prices.
The Scioto STAR Fire Brick Works.
PORTSMOUTH, OHIO.
Send for Catalogue
Established 1871.
Incorporated 1876.

THE **COLUMBIA FIRE CLAY CO.**
MINERS AND SHIPPERS OF
--- High Grade Plastic Clay. ---
Adapted for all service requiring high refractory qualities. Office,
412 Cuyahoga Building, CLEVELAND O.

The consolidated Iron Trade Review and Industrial World—the leading Machinery, Foundry and Iron and Steel paper west of New York City.

P. G. COCHRAN, President.
J. H. WURTZ, Secretary.

J. R. LAUGHREY, Treasurer.
J. S. NEWMEYER, Manager.

WASHINGTON COAL & COKE CO.

3,500 Acres of Coal.

5,000 Tons Daily Capacity. 350 Individual Coal and Coke Cars.

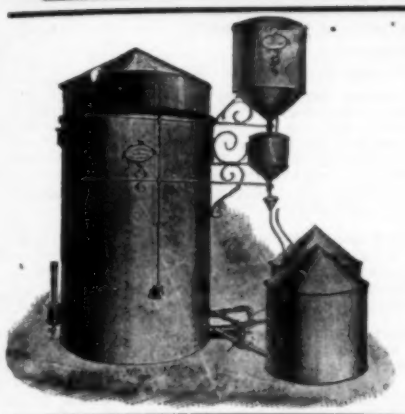
YOUGHIOGHENY COAL
For Steel Works, Rolling Mills, Tin Plate Works, Locomotive Fuel, etc.

COKING COAL
For Bee Hive or By-Product Ovens.

Our WASHINGTON COKE
Is unsurpassed for uniform purity and general satisfaction in **Blast Furnace and Cupola Practice.** Quality and prompt attention to shipments insure us the preference.

General Office,
DAWSON, FAYETTE CO., PA.

Sales Office, Pittsburg, Pa.,
N. P. HYNDMAN, Sales Agent.



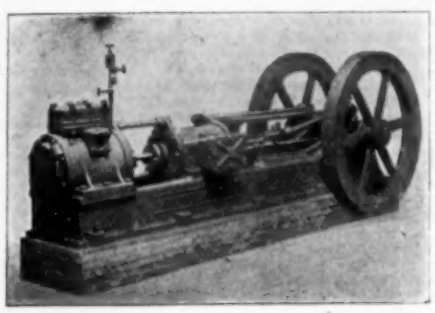
TWENTY-FOUR HOURS OF DAYLIGHT

Can be obtained by lighting your workshops, residences, and buildings of all kinds by

Acetylene Gas.

This **purest, strongest** and **cheapest** artificial light known is produced by the PATTERSON Automatic Acetylene Generator. This machine is guaranteed the best on the market on account of its complete detail and simple operation. Particularly applicable to isolated plants. Address

The Norwalk Foundry & Machine Co., Manufacturers. **Norwalk, O.**



Air Compressors
for Air Lift Well Pumping.

Air Compressors
for Rock Drills, Coal Cutters, Air Hoists and Pneumatic work generally.

Pressure Pumps
for Cotton Oil Mills and Cotton Compressors.

Steam Pumps,
Single and Duplex, of all sizes and for all purposes.

Duplex and Triplex POWER PUMPS.

CORRESPONDENCE SOLICITED.

HALL STEAM PUMP COMPANY, Pittsburg, Pa.

"METALLURGY OF CAST IRON"

By THOS. D. WEST; 107 engravings, 583 pages. Just issued. A valuable work to Founder, Molder, Draughtsman, Designer Technical School Specialist. Chemistry of Iron; cheaping of mixtures; the effect of the metalloids in changing the grade of iron; latest improvements in cupola construction and practice—all are fully covered. Price $3. Sent postpaid on receipt of price, by *The Iron Trade Review Co.*, Cleveland, O; 1522 Monadnock Block, Chicago, Ill.

James M. Swank, author of "Iron in All Ages," and editor of the *Bulletin* of The American Iron & Steel Association, in reviewing "Metallurgy of Cast Iron," says it is, "One of the most valuable publications relating to the manufacture of iron castings, that has ever, to our knowledge been issued in this or any other country."

FOR SALE!

CHEAP!

A SET OF PATENT

Fire Extinguishers

AND

Fire Pails.

BRAND NEW.

Can be used in any factory, office or building. Address for prices,

"B," care of The Iron Trade Review,
CLEVELAND, O.

Molders' Text Book,

Being Part II of American Foundry Practice, giving the best methods and rules for obtaining good castings, with detailed description for making molds. A thoroughly practical book that should be in the hands of every molder. By Thomas D. West. 460 pages; cloth..... $2.50

Sent, postpaid on receipt of price, by

The Iron Trade Review Co.,
CHICAGO. CLEVELAND. PITTSBURG

BUYERS' DIRECTORY.

Acetylene Gas Lamps—
The Norwalk Fdy. & Machine Co., Norwalk, O.

Air Compressors—
Edw. P. Allis Co., Milwaukee, Wis.
Rand Drill Co., Chicago, Ill.
The Lane & Bodley Co., Cincinnati, O.
Clayton Air Compressor Works, New York.
Ingersoll-Sargent Drill Co., New York.
Hall Steam Pump Co., Pittsburg, Pa.

Air Lift Pumps—
Clayton Air Compressor Works, New York.
The Ingersoll-Sergeant Drill Co., New York.

Analytical Chemists—
Dickman & MacKenzie, Chicago, Ill.
F. A. Emmerton, Cleveland, O.
O. Textor, Cleveland, O
The Robert W. Hunt & Co., Chicago, Ill.
Benedict Crowell, Cleveland, O.
John T. Jones & Co., Chicago, Ill.
J. Blodgett Britton & Co., Warrenton, Va.

Annealing Boxes—
Meehan Boiler & Construction Co., Lowellville, Ohio.

Anti-Friction Metal—
C. H. Besly & Co., Chicago, Ill.
North American Metalline Co., Long Island City, N. Y.
Wm. Cramp & Sons, Philadelphia, Pa.
Swarts Metal Refining Co., Chicago, Ill.

Automatic Machinery—
A. H. Nilson Machine Co., Bridgeport, Conn.

Babbitt Metal—
C. H. Besly & Co., Chicago, Ill.
Swarts Metal Refining Co., Chicago, Ill.

Bar Iron and Steel—
Ætna-Standard Iron & Steel Co., Bridgeport, O.
Bourne-Fuller Co., Cleveland, O.

Bearing Metal—
C. H. Besly & Co., Chicago, Ill.
North American Metalline Co., Long Island City, N. Y.
Swarts Metal Refining Co., Chicago, Ill.

Bellows—
The S. Obermayer Co., Cincinnati, O.

Belting—
C. H. Besly & Co., Chicago, Ill.
The Chicago Rawhide Mfg. Co., Chicago, Ill.
The Gandy Belting Co., Baltimore Md.
Cleveland Tool & Supply Co., Cleveland, O.
Main Belting Co., Philadelphia, Pa.

Belt Lacing—
The Bristol Co., Waterbury, Conn.

Bench Vises—
Massey Vise Co., Chicago, Ill.

Blacksmith and Carriage Supplies—
C. H. Besly & Co., Chicago, Ill.

Black Lead—
The S. Obermayer Co., Cincinnati, O.

Blowers—
B. F. Sturtevant Co., Boston, Mass
American Gas Furnace Co., New York City.

Blast Furnace Work—
Enterprise Boiler Co., Youngstown, O.
Meehan Boiler & Construction Co., Lowellville, Ohio.
The Wm. B. Pollock Co., Youngstown, O.
Riter-Conley Mfg. Co., Pittsburg, Pa.

Boilers and Boiler Attachments—
The Wm. B. Pollock Co., Youngstown, O.
Cahall Sales Department, Pittsburg, Pa.
Enterprise Boiler Co., Youngstown, O.
The Edward P. Allis Co., Milwaukee, Wis.
Hooven, Owens & Rentschler Co., Hamilton, O.
Harrison Safety Boiler Works, Philadelphia.
Lane & Bodley Co., Cincinnati, O.
Meehan Boiler & Construction Co., Lowellville, Ohio.
Wm. Cramp & Sons, Philadelphia, Pa.
Riter-Conley Mfg. Co., Pittsburg, Pa.
The Aultman Co., Canton, O.

Boiler Covering—
C. H. Besly & Co., Chicago, Ill.

Boiler Fronts and Fittings—
The Lane & Bodley Co., Cincinnati, O.
Playford Stoker Co., Cleveland, O.

Boiler Tubes—
S. Fix Sons, Cleveland, O.
National Tube Works Co., McKeesport, Pa.

Boiler Tube Cleaners—
Union Boiler Tube Cleaner Co., Pittsburg, Pa

Bolt Forging Machines—
Chicago Die and Machine Works, Chicago, Ill.

Bolts and Nuts—
Upson Nut Co., Cleveland, O.
Rockford Bolt Works, Rockford, Ill.

Bolt and Nut Machinery—
Chicago Die and Machine Works, Chicago, Ill.

Boring and Turning Mills—
H. Bickford, Lakeport, N. H.
U. Baird Machinery Co., Pittsburg, Pa.
Baush & Harris Machine Tool Co., Springfield, Mass.

Brass Castings—
J. J. Ryan & Co., Chicago, Ill.

Brass Founders Supplies—
The S. Obermayer Co., Cincinnati, O.

Bridges—
Shiffler Bridge Co., Pittsburg.

Buildings (Steel Frame.)—
Shiffler Bridge Co., Pittsburg.
Riter-Conley Mfg. Co., Pittsburg, Pa.

Carrying Tongs—
Vulcan Mfg. Co., Pittsburg, Pa.

Castings—
Seaman-Sleeth Co., Pittsburg, Pa.
Lane & Bodley Co., Cincinnati, O.
Hooven, Owens & Rentschler Co., Hamilton, O.
W. A. Jones Foundry Co., Chicago, Ill.
Brass Founders' Supply Co., Newark, N. J.
The Aultman Co., Canton, O.
Riverside Foundry Co., Cleveland, O.

Castings (Aluminum)—
J. J. Ryan & Co., Chicago, Ill.

Castings (Brass)—
J. J. Ryan & Co., Chicago, Ill.

Castings (Bronze)—
J. J. Ryan & Co., Chicago, Ill.

Chain Hoists—
Edwin Harrington Son & Co., Philadelphia, Pa.
Reading Crane & Hoist Works, Reading, Pa.

Chain Belting—
Heyl & Patterson, Pittsburg, Pa.
Jeffrey Mfg. Co., Columbus, O.
Link-Belt Machinery Co., Chicago, Ill.
The Aultman Co., Canton, O.

Channelers—
The Ingersoll-Sergeant Drill Co., New York.

Charcoal—(Lump, powdered, granulated)—
The S. Obermayer Co., Cincinnati, O.

Chemists—
Dickman & MacKenzie, Chicago, Ill.
F. A. Emmerton, Cleveland, O.
O. Textor, Cleveland, O.
The R. W. Hunt & Co., Chicago, Ill.
Benedict Crowell, Cleveland, O.
John T. Jones & Co., Chicago, Ill.
J. Blodgett Britton & Co., Warrenton, Va.

Chilled and Sand Rolls—
Wm. Tod & Co., Youngstown, O
Seaman. Sleeth Co., Pittsburg, Pa.
Riverside Foundry Co., Cleveland, O.

Chucks—
Skinner Chuck Co., New Britain, Conn.
Massey Vise Co., Chicago, Ill.

Coal Cutters—
The Ingersoll-Sergeant Drill Co., New York.
Jeffrey Mfg. Co., Columbus, O.

Coal Screens—
Rob't. Aitchinson Per. Metal Co., Chicago, Ill.
Harrington & King Per. Co., Chicago, Ill.
Jeffrey Mfg. Co., Columbus, O.
The Aultman Co., Canton, O.

Coal and Coke—
Forster, Waterbury & Co., Chicago, Ill.
H. C. Frick Coke Co., Pittsburg, Pa.
McKeefrey & Co., Leetonia, O.
Washington Coal and Coke Co., Pittsburg, Pa.

Coal Mining Machinery—
Jeffrey Mfg. Co., Columbus, O.

Conveyors—
Jeffrey Mfg. Co., Columbus, O.
Heyl & Patterson, Pittsburg, Pa
Link-Belt Machinery Co., Chicago, Ill.
The Aultman Co., Canton, O.
The Brown Hoisting and Conveying Machine Co., Cleveland, O.

Comparometers—
Vulcan Mfg. Co., Pittsburg, Pa.

Compressed Air Shop Tools—
Clayton Air Compressor Works, New York City.
Rand Drill Co., Chicago, Ill.
The Ingersoll-Sergeant Drill Co., New York.
Q & C Co., Chicago Ill.
American Pneumatic Tool Co., New York City.

Compression Couplings—
The Aultman Co., Canton, O.
Geo. B. Sennett Co., Youngstown, Ohio.

Contractors for Cleaning Boilers—
Union Boiler Tube Cleaner Co., Pittsburg, Pa.

Core Ovens—
Millett Core Oven Co., Brightwood, Mass.

Corrugated Iron—
Berger Mfg. Co., Canton, O.
Ætna-Standard Iron & Steel Co., Bridgeport, O.

Cranes and Derricks—
Wm. Tod & Co., Youngstown O.
Marion Steam Shovel Co., Marion, O.
Edwin Harrington, Son & Co., Philadelphia.
Reading Crane & Hoist Works, Reading, Pa.
The Bucyrus Co., South Milwaukee, Wis.
Brown Hoisting and Conveying Machine Co., Cleveland, Ohio.

Crucibles—
The S. Obermayer Co., Cincinnati, O.

Cupolas—
The S. Obermayer Co., Cincinnati, O.
Riter-Conley Mfg. Co., Pittsburg, Pa.

Dredges—
Marion Steam Shovel Co., Marion, O.
The Bucyrus Co., South Milwaukee, Wis.

Drill Grinders—
J. Wendell Cole, Columbus, O.

Drill Presses—
C. H. Besly & Co., Chicago, Ill.
U. Baird Machinery Co., Pittsburg, Pa.
Edwin Harrington, Son & Co., Philadelphia.
Fox Machine Co., Grand Rapids, Mich.
Bickford Drill & Tool Co., Cincinnati, O.
Cleveland Tool & Supply co., Cleveland, O.
Baush & Harris Machine Tool Co., Springfield, Mass.

Drop Forgings—
Wyman & Gordon, Worcester, Mass.

Drop Presses—
Bertsch & Co., Cambridge City, Ind.
C. H. Besly & Co., Chicago, Ill.
Fox Machine Co., Grand Rapids, Mich.
R. Konigslow & Bro., Cleveland, O.

Drop Hammers—
Baush & Harris Machine Tool Co., Springfield, Mass.

Dry Kilns—
B. F. Sturtevant Co., Boston.

Dynamos—
Jeffrey Mfg. Co., Columbus, O.

Eave Troughs and Conductors—
Berger Mfg. Co., Canton, O.

Elevators—
The Lane & Bodley Co., Cincinnati, O.

Elevating and Conveying Machinery—
Heyl & Patterson, Pittsburg, Pa.
Jeffrey Mfg. Co., Columbus O.
Link-Belt Machinery Co., Chicago, Ill.
Lidgerwood Mfg. Co., New York City.
The Aultman Co., Canton, O.
The Brown Hoisting and Conveying Machine Co., Cleveland, O.

Emery and Corundum Wheels—
J. Wendell Cole, Columbus and Chicago.
Northampton Emery Wheel Co., Chicago, Ill.
Cleveland Tool & Supply Co., Cleveland, O.
Vitrified Wheel Co., Westfield, Mass.

Emery Wheel Machinery—
J. Wendell Cole, M. E., Columbus, O., or Chicago, Ill
C. H. Besly & Co., Chicago Ill.
Northampton Emery Wheel Co., Chicago, Ill.
Cleveland Tool & Supply Co., Cleveland, O.

Engineers and Contractors—
Heyl & Patterson, Pittsburg, Pa
Meehan Boiler & Construction Co., Lowellville Ohio.
E. E. Erickson, Pittsburg, Pa.
Benedict Crowell, Cleveland, O.
John T. Jones & Co., Chicago, Ill.
Riter-ConleyMfg. Co., Pittsburg, Pa.
Jeffrey Mfg. Co., Columbus, O.

Engine Packing—
Jenkins Bros., New York City.
C. H. Besly & Co., Chicago, Ill.

Engineers' Supplies—
C. H. Besly & Co., Chicago, Ill.
Jenkins Bros., New York City.

Engine Lathes—
U. Baird Machinery Co., Pittsburg, Pa.
Edwin Harrington & Son Co., Philadelphia

Engines (Oil)—
The Aultman Co., Canton, O.

Engines (Steam)—
Wm. Tod & Co., Youngstown, O.
B. F. Sturtevant Co., Boston, Mass.
The Edward P. Allis Co., Milwaukee, Wis.
The Hooven, Owens & Rentschler Co., Hamilton, O.
Lane & Bodley Co., Cincinnati, O.
The Aultman Co., Canton, O.
Geo. B. Sennett Co., Youngstown, Ohio.

Engravers and Electrotypers—
Central Electrotype & Engraving Co., Cleveland, O.
National Engraving Co., Cleveland, O.
Eclipse Electrotype & Eng. Co., Cleveland, O.

Exhaust Heating Apparatus—
B. F. Sturtevant Co., Boston, Mass.

Fans—
American Gas Furnace Co., New York City.
B. F. Sturtevant Co., Boston, Mass.

Feed Water Heaters and Purifiers—
Stilwell-Bierce & Smith-Vaile Co., Dayton, O.
Harrison Safety Boiler Works, Philadelphia, Pa.

Files, Makers of—
C. H. Besly & Co., Chicago, Ill.

Fire Brick and Clay—
J. V. Rose, Sharon, Pa.
Union Mining Co., Mt. Savage, Md.
Clearfield Fire Brick Co., Clearfield,
Dover Fire Brick Co., Cleveland, Pa
Diamond Fire Brick Works, Akron, O.
F. B. Stevens, Detroit, Mich.
The S. Obermayer Co., Cincinnati, O
Chicago Fire Clay Product Co., Chicago, Ill.
Columbia Fire Clay Co., Cleveland, O.
Scioto Star Fire Brick Works, Portsmouth, O.
Kentucky Fire Brick Works, Portsmouth O.
Webster Fire Brick Co., South Webster, O.
Ætna Fire Brick Co., Oak Hill, O.
Oak Hill Fire Brick & Coal Co., Oak Hill, O.
Holmes, Strachan & Co., Detroit, Mich.

Fire Proof Covering—
C. H. Besly & Co., Chicago, Ill.

Flexible Shafts—
Union Boiler Tube Cleaner Co., Pittsburg, Pa.

Foot and Power Lathes—
U. Baird Machinery Co., Pittsburg, Pa.
Edwin Harrington Son & Co., Philadelphia, Pa

Foundries—
Wm. Tod & Co., Youngstown, O.
Seaman, Sleeth Co., Pittsburg, Pa.
The Lane & Bodley Co., Cincinnati, O.
Hooven, Owens & Rentschler Co., Hamilton, O.
W. A. Jones Foundry Co., Chicago.
Jeffrey Mfg. Co., Columbus, O.
Brass Founders' Supply Co., Newark, N. J.
The Aultman Co., Canton, O.
Riverside Foundry Co., Cleveland, O.

Foundry Equipments—
The S. Obermayer Co., Cincinnati, O.

Foundry Supplies—
Clearfield Fire Brick Co., Clearfield, Pa.
The Ohio Sand Co., Conneaut, O.
Union Mining Co., Mt. Savage, Md.
Dover Fire-Brick Co., Cleveland, O.
Tabor Mfg. Co., Elizabeth, N. J.
F. B. Stevens, Detroit, Mich.
Heber Wells, New York City.
Millett Core Oven Co., Brightwood, Mass.
Hanson McDowell, Chicago, Ill.
Cleveland Facing Mill Co., Cleveland, O.
The S. Obermayer Co., Cincinnati, O.
Garden City Sand Co., Chicago, Ill.
Chicago Fire Clay Product Co., Chicago, Ill.
Brass Founders' Supply Co., Newark, N. J.
Columbia Fire Clay Co., Cleveland, O.
Vulcan Mfg. Co., Pittsburg, Pa.
Scioto Star Fire Brick Works, Portsmouth, O.
Kentucky Fire Brick Works, Portsmouth, O.
Webster Fire Brick Co., South Webster, O.
Ætna Fire Brick Co., Oak Hill, O.
J. V. Rose, Sharon, Pa.
Diamond Fire Brick Works, Akron, O.
Oak Hill Fire Brick & Coal Co., Oak Hill, O.
Holmes, Strachan & Co., Chicago, Ill.
Newport Sand Bank Co., Newport, Ky.

Foundry Facing—
The S. Obermayer Co., Cincinnati, O.
Cleveland Facing Mill Co., Cleveland, O.

Forgings—
Cleveland City Forge & Iron Co., Cleveland, O.
Bethlehem Iron Co., South Bethlehem, Pa.
Braeburn Steel Co., Braeburn, Pa.
Wyman & Gordon, Worchester, Mass.

Friction Metal—
C. H. Besly & Co., Chicago, Ill.
North American Metaline Co., Long Island City, New York.
Swarts Metal Refining Co., Chicago, Ill.

Furnaces—
Brightman Furnace Co., Cleveland, O.
Playford Stoker Co., Cleveland, O.

Furnace Linings—
Union Mining Co., Mt. Savage, Md.

Fuel Oil Burners—
W. S. Rockwell & Co., New York City
American Gas Furnace Co., New York City.

Galvanized Iron—
Apollo Iron & Steel Co., Pittsburg, Pa.

Galvanizers—
Ætna-Standard Iron & Steel Co., Bridgeport, O.
Apollo Iron & Steel Co., Pittsburg, Pa.

Galvanizing Pots—
The Wm. B. Pollock Co., Youngstown, O.

Gas Burners—
American Gas Furnace Co., New York City.

Gas Furnaces
American Gas Furnace Co., New York City.

Gear Cutting—
The R. D. Nuttall Co., Allegheny, Pa
Brainard Milling Machine Co., Hyde Park, Mass.
The Van Dorn & Dutton Co., Cleveland, O.

Gear Cutters—
Brainard Milling Machine Co., Hyde Park, Mass.

Grindstones—
C. H. Besly & Co., Chicago, Ill.

Graphite Paint—
Jos. Dixon Crucible Co., Jersey City N. J.

Grate Bars—
Geo. B. Sennett Co., Youngstown, Ohio.

Gray Iron Castings—
W. A. Jones Foundry Co., Chicago, Ill.
The Lane & Bodley Co., Cincinnati, O.
Brass Founders' Supply Co., Newark, N. J.

Hack Saws—
Millers Falls Co., New York City.
Q & C Co., Chicago, Ill.

Hangers—
E. A. Delano, Chicago, Ill.
Dodge Mfg. Co., Mishawaka, Ind.
The Aultman Co., Canton, O.
Jones & Laughlins, Ltd., Pittsburg, Pa.

Harness Snaps—
Covert Mfg. Co., West Troy, N. Y.

Hoists—
Edwin Harrington Son & Co., Philadelphia,
Reading Crane & Hoist Works, Reading, Pa.
The Lane & Bodley Co., Cincinnati, O.
The Aultman Co., Canton, O.
Lidgerwood Mfg. Co., New York City.

Heaters and Purifiers—
Harrison Safety Boiler Works, Philadelphia
Stilwell-Bierce & Smith-Vaile Co., Dayton, O.

Heating and Ventilating Apparatus
B. F. Sturtevant Co., Boston.

Heavy Hardware—
C. H. Besly & Co., Chicago, Ill
Parkhurst & Wilkinson Co., Chicago, Ill.

Hoisting Engines—
The Edward P. Allis Co., Milwaukee, Wis.
Earle C. Bacon, New York City.
The Lane & Bodley Co., Cincinnati, O.
Lidgerwood Mfg. Co., New York City.
The Aultman Co., Canton, O.

Hoisting Machinery—
Link-Belt Machinery Co., Chicago, Ill.
Reading Crane & Hoist Works, Reading, Pa.
Jeffrey Mfg. Co., Columbus, O.
The Lane & Bodley Co., Cincinnati, O.
Earl C. Bacon, New York City.
Lidgerwood Mfg. Co., New York City.
Heyl & Patterson, Pittsburg, Pa.
The Aultman Co., Canton, O.
The Brown Hoisting and Conveying Machine Co., Cleveland, O.

Horse Shoes—
Phoenix Horse Shoe Co., Joliett, Ill.

Hotels—
United States Hotel Co., Cleveland, O.

Hydraulic Machinery—
Stilwell-Bierce & Smith-Vaile Co., Dayton, O.

Injectors—
C. H. Besly & Co., Chicago, Ill.

Insurance Companies—
Hartford Steam Boiler I. & I. Co., Hartford, Ct

Iron Buildings—
Shiffler Bridge Co Pittsburg Pa
Riter-Conely Co., Pittsburg, Pa.

Iron Nails and Steel—
Bethlehem Iron Co., South Bethlehem, Pa.
C. H. Besly & Co. Chicago, Ill
E. H. Stroud & Co., Chicago, Ill
Parkhurst & Wilkinson Co., Chicago, Ill.

Iron and Steel Roofing—
Berger Mfg. Co., Canton, O.
Ætna-Standard Iron & Steel Co., Bridgeport, O

Iron Ore—
Lake Superior Consolidated Iron Mines New York City, N. Y.
Oglebay, Norton & Co., Cleveland, O.
M. A. Hanna & Co., Cleveland, O.

Iron Working Tools—
H. Bickford, Lakeport, N. H
C. H. Besly & Co. Chicago, Ill
The F. B. Shuster Co., New Haven, Conn.
U. Baird Machinery Co. Pittsburg, Pa.
Edwin Harrington Son & Co., Philadelphia, Pa.
Fox Machine Co., Grand Rapids, Mich.
Armstrong Bros. Tool Co., Chicago, Ill.
The Armstrong Mfg. Co., Bridgeport, Conn.
Chicago Die and Machine Works, Chicago, Ill.
Bickford Drill & Tool Co., Cincinnati, O.
Skinner Chuck Co., New Britain, Conn.
Cleveland Tool & Supply Co., Cleveland, O.
Brainard Milling Machine Co., Hyde Park, Mass.
Baush & Harris Machine Tool Co., Springfield, Mass.
Massey Vise Co., Chicago, Ill.

Link Belting
The Jeffrey Mfg. Co., Columbus, O.
Link-Belt Machinery Co., Chicago, Ill.
Heyl & Patterson, Pittsburg, Pa.
The Aultman Co., Canton, O.

Ladles—
The S. Obermayer Co., Cincinnati, O.

Lathes—
U. Baird Machinery Co., Pittsburg, Pa.
Edwin Harrington, Son & Co., Philadelphia.
Bickford Drill & Tool Co., Cincinnati, O.

Machinery Name Plates—
August Becker, Boston, Mass.

Machinists' Tools and Supplies—
H. Bickford, Lakeport, N. H.
C. H. Besly & Co., Chicago, Ill.
U. Baird Machinery Co., Pittsburg, Pa.
Bertsch & Co., Cambridge City, Ind.
Edwin Harrington Son & Co., Philadelphia, Pa.
Fox Machine Co., Grand Rapids, Mich.
Armstrong Bros. Tool Co., Chicago, Ill.
Bickford Drill & Tool Co., Cincinnati, O.
Parkhurst & Wilkinson Co., Chicago, Ill.
Skinner Chuck Co., New Britain, Conn.
Cleveland Tool & Supply Co., Cleveland, O.
Baush & Harris Machine Tool Co., Springfield, Mass.
Massey Vise Co., Chicago, Ill.

Machinists' Vises—
Massey Vise Co., Chicago, Ill.

Machine Screws—
C. H. Besly & Co., Chicago, Ill

Machine Shops—
The R. D. Nuttall Co., Allegheny, Pa.
The Lane & Bodley Co., Cincinnati, O.

Machinery and Tool Steel—
C. H. Besley & Co., Chicago, Ill.
Braeburn Steel Co., Braeburn, Pa.
Crescent Steel Co., Pittsburg, Pa.
La Belle Steel Co., Pittsburg, Pa
Sanderson Bros. Steel Co., Cleveland, O.
Byron H. White, Chicago, Ill.
Morris & Bailey Steel Co., Pittsburg, Pa.

Magnesia Covering—
C. H. Besly & Co., Chicago, Ill

Manufactured Iron & Steel—
Bourne-Fuller & Co., Cleveland, O.
Cleveland Rolling Mill Co., Cleveland, O.
Ætna-Standard Iron & Steel Co Bridgeport, O.
The Morris & Bailey Steel Co., Pittsburg, Pa.
Parkhurst & Wilkinson Co., Chicago, Ill.
Ohio Steel Co., Youngstown, O.

Metal Bearings—
North American Metaline Co., Long Island City, N. Y
C. H. Besly & Co., Chicago, Ill.

Milling Machines—
U. Baird Machinery Co., Pittsburg, Pa.
Fox Machine Co., Grand Rapids, Mich.
Brainard Milling Machine Co., Hyde Park, Mass.

Mining Machinery—
C. H. Besly & Co., Chicago, Ill.
The Edward P. Allis Co., Milwaukee, Wis.
Earle C. Bacon, New York City.
The Lane & Bodley Co., Cincinnati, O.
Jeffrey Mfg. Co., Columbus, O.
Lidgerwood Mfg. Co., New York City.
Wm. Cramp & Sons, Philadelphia, Pa.
The Bucyrus Co., South Milwaukee, Wis.
Marion Steam Shovel Co., Marion, O.

Molding Machines—
Tabor Mfg. Co., Elizabeth, N. J.

Mine Pumps
Fred M. Prescott Steam Pump Co., Milwaukee, Wis.

Molding Sand—
Ohio Sand Co., Conneaut, O.
F. B Stevens, Detroit, Mich.
S. Obermayer Co., Cincinnati, O.
Garden City Sand Co., Chicago, Ill.
Newport Sand Bank Co., Newport, Ky.

Molders' Tools—
The S. Obermayer Co., Cincinnati, O.

Name Plates—
August Becker, Boston, Mass.

Nickel Plating Outfits—
Northampton Emery Wheel Co., Chicago, Ill.

Nuts and Bolts
Rockford Bolt Works, Rockford, Ill.
Upson Nut Co., Cleveland, O.

Oilless Bearings—
North American Metaline Co., Long Island, City, N. Y
C. H. Besly & Co., Chicago, Ill.

Oil Burners—
W. S. Rockwell & Co. New York City
American Gas Furnace Co., New York City.

Oil Cups—
C. H. Besly & Co., Chicago, Ill.

Oil Pumps—
C. H. Besly & Co., Chicago, Ill.

Ore Crushers—
The Edward P. Allis Co., Milwaukee, Wis.
Jeffrey Mfg. Co., Columbus, O.
The Aultman Co., Canton, O.

Ore Screens—
Rob't Aitchison Per. Metal Co., Chicago, Ill.
Harrington & King Per. Co., Chicago, Ill.
The Aultman Co., Canton, O.

Packing—
C. H. Besly & Co., Chicago Ill
Jenkins Bros., New York City.

Paint—
Iron Clad Paint Co., Cleveland, O.
Jos. Dixon Crucible Co., Jersey City N. J.
Standard Paint Co., New York, City.

Pattern Letters—
Heber Wells, New York City.

Pattern Makers' Vises—
Massey Vise Co., Chicago, Ill.

Pattern Works—
Gobeille Pattern Co., Cleveland, O

Perforated Sheet Metal
Harrington & King Perforating Co., Chicago, Ill
Aitchison Perforated Metal Co., Chicago, Ill.

Pig Iron—
Clinton Iron & Steel Co., Pittsburg.
Forster, Waterbury & Co. Chicago, Ill.
Bourne-Fuller Co. Cleveland, O.
M. A. Hanna & Co., Cleveland, O
E. H. Stroud & Co., Chicago, Ill.
F. B. Stevens, Detroit, Mich.
McKeefrey & Co., Leetonia, O.
Superior Charcoal Iron Co., Grand Rapids, Mich
Hickman & Williams, Chicago, Ill.
Shenango Valley Steel Co., New Castle, Pa.
Spearman Iron Co., Sharpsville, Pa.
Salisbury Carbonate Iron Co., New York City.

Pipe Covering—
C. H Besly & Co., Chicago Ill.
Jenkins Bros., New York City.

Pipe Cutting and Threading Machines—
The Armstrong Mfg. Co., Bridgeport, Conn.

Planers—
U. Baird Machinery Co., Pittsburg, Pa.
Bickford Drill & Tool Co., Cincinnati, O.

Planer Chucks—
Massey Vise Co., Chicago, Ill.

Plates—
Enterprise Boiler Co., Youngstown, O.

Plumbago—
The S. Obermayer Co., Cincinnati, O.

Plumbers' and Gas Fitters' Supplies—
C. H. Besly & Co., Chicago, Ill.

Pneumatic Appliances—
Clayton Air Compressor Works, New York

Pneumatic Tools —
American Pneumatic Tool Co., New York City
Q & C Co., Chicago, Ill.

Portable Forges
C. H. Besly & Co., Chicago, Ill
B. F. Sturtevant Co., Boston, Mass.
Vulcan Mfg. Co., Pittsburg, Pa.

Power Drop Hammers—
Baush & Harris Machine Tool Co., Springfield Mass.

Power Presses—
Bertsch & Co., Cambridge City, Ind.
Fox Machine Co., Grand Rapids, Mich.
E. Konigslow & Bro. Cleveland, O.

Power Transmission Machinery—
Jeffrey Mfg. Co., Columbus, O.
The Lane & Bodley Co., Cincinnati, O
E. A. Delano, Chicago, Ill.
Dodge Mfg. Co., Mishawaka, Ind.
The Aultman Co., Canton, O.
Jones & Laughlins, Ltd., Pittsburg, Pa.

Presses—
Bertsch & Co., Cambridge City, Ind.
C. H. Besly & Co. Chicago, Ill
E. Konigslow & Bro. Cleveland, O.

Pressure Gauges—
The Bristol Co., Waterbury, Conn.

Pulleys—
W. A. Jones Foundry Co., Chicago, Ill
The Lane & Bodley Co., Cincinnati, O
E. A. Delano, Chicago, Ill.
Dodge Mfg. Co., Mishawaka, Ind.
The Aultman Co., Canton, O.
Jeffrey Mfg. Co., Columbus, O.
Jones & Laughlins, Ltd., Pittsburg, Pa.

Pumps (Steam)
The Edward P. Allis Co., Milwaukee, Wis.
Stilwell-Bierce & Smith-Vaile Co., Dayton O.
Blakeslee Mfg. Co. Du Quoin, Ill.
Fred M. Prescott Steam Pump Co., Milwaukee, Wis.
Hall Steam Pump Co., Pittsburg, Pa.

Punches—
E. Konigslow & Bro. Cleveland, O.

Pyrometers—
Edward Brown, Philadelphia, Pa.
Vulcan Mfg. Co., Pittsburg, Pa.

Railway Supplies—
Cleveland City Forge & Iron Co., Cleveland, O.

Rivets—
Champion Rivet Co., Cleveland, O.
Jones & Laughlins, Ltd., Pittsburg, Pa.

Riveted Steel Pipe—
The Wm. B. Pollock Co. Youngstown, O.

Rock Drills—
Rand Drill Co., Chicago, Ill.
The Ingersoll-Sergeant Drill Co., New York.

Roofs—
Shiffler Bridge Co., Pittsburg.
Riter-Conley Mfg. Co., Pittsburg, Pa.

Sand and Chill Rolls—
Seaman, Sleeth Co., Pittsburg, Pa.

Saws—
Peter Gerlach & Co., Cleveland, O.

Screens for Coal Ore, Etc.
Robt. Aitchison Perforated Metal Co., Chicago.
Harrington & King Perforating Co., Chicago.
Jeffrey Mfg. Co., Columbus, O.
The Aultman Co., Canton, O.

Screws—
C. H. Besly & Co., Chicago, Ill.
Upson Nut Co., Cleveland, O.
Chicago Screw Co., Chicago, Ill
Rockford Bolt Works, Rockford, Ill.

Shafting—
The Lane & Bodley Co., Cincinnati, O.
E. A. Delano, Chicago, Ill.
Dodge Mfg. Co., Mishawaka, Ind.
Fitzsimmons & Co., Cleveland, O.
The Aultman Co., Canton, O.
Jeffrey Mfg. Co., Columbus, O.
Jones & Laughlins, Ltd., Pittsburg, Pa.

Shapers—
Baush & Harris Machine Tool Co., Springfield, Mass.

Shearing and Punching Machinery—
Bertsch & Co., Cambridge City, Ind.
Fox Machine Co., Grand Rapids, Mich.

Sheet Iron—
Cleveland Rolling Mill Co., Cleveland, O.
Ætna-Standard Iron & Steel Co., Bridgeport, O.
E. H. Stroud & Co., Chicago, Ill.

Ship Yards—
Wm. Cramp & Sons, Philadelphia, Pa.

Special Machinery—
Edwin Harrington Son & Co., Philadelphia.
Q & C Co., Chicago, Ill.
A. H. Nilson Machine Co., Bridgeport, Conn.
The Aultman Co., Canton, O.
Jeffrey Mfg. Co., Columbus, O.
E. Konigslow & Bro. Cleveland, O.

Stand Pipes—
The Wm. B. Pollock Co., Youngstown, O.

Steam Boiler Inspectors—
Hartford Steam Boiler Inspection & Insurance Co., Hartford, Conn.

Steam Pipe and Boiler Covering—
C. H. Besly & Co., Chicago Ill.

Steam Packing—
C. H. Besly & Co., Chicago, Ill.

Steam Pumps—
Hall Steam Pump Co., Pittsburg, Pa.
Stilwell-Bierce & Smith-Vail Co., Dayton, O.
Blakeslee Mfg. Co., Du Quoin, Ill.

Steam Shovels and Dredges—
Marion Steam Shovel Co., Marion, O.
The Bucyrus Co., South Milwaukee, Wis.

Steam Specialties—
C. H. Besly & Co., Chicago, Ill.

Steel—
Otis Steel Co., Cleveland, O.
E. H. Stroud & Co., Chicago, Ill.
Bræburn Steel Co., Bræburn, Pa.
Crescent Steel Co., Pittsburg, Pa.
La Belle Steel Co., Pittsburg, Pa.
The Morris & Bailey Steel Co., Pittsburg, Pa.
Sanderson Bros. Steel Co., Cleveland, O.
Byron H. White, Chicago, Ill.

Steel Castings—
Otis Steel Co., Cleveland, O.
Q & C Co., Chicago, Ill.
Hanson McDowell, Chicago, Ill.

Steel Plants—
The Wm. B. Pollock Co., Youngstown, O.
The Riter-Conley Co., Pittsburg, Pa.

Steel Blooms and Billets—
Cleveland Rolling Mill Co., Cleveland.
Bethlehem Iron Co., South Bethlehem, Pa.
Ohio Steel Co., Youngstown, Ohio.
Shenango Valley Steel Co., New Castle, Pa.
The Lorain Steel Co., Lorain, O.
Jones & Laughlins, Ltd., Pittsburg, Pa.

Steel Stamps and Stencils—
J. H. Fleharty & Co., Cleveland, O.

Semi-Steel—
Hanson McDowell, Chicago, Ill.

Stokers—
Playford Stoker Co., Cleveland, O.

Tanks—
Enterprise Boiler Co., Youngstown, O.
Meehan Boiler & Construction Co., Lowellville, Ohio.
The Wm. B. Pollock Co., Youngstown, O.
Riter-Conley Mfg. Co., Pittsburg, Pa.
The Aultman Co., Canton, O.

Tank Cars—
The Wm. B. Pollock Co., Youngstown, O.

Tin and Terne Plates—
B. P. Crane & Co., Chicago, Ill.
E. H. Stroud & Co., Chicago, Ill.
American Tin Plate Company, Chicago, Ill.

Tool Steel—
C. H. Besly & Co., Chicago, Ill.
Bræburn Steel Co., Bræburn, Pa.
Crescent Steel Co., Pittsburg, Pa.
La Belle Steel Co., Pittsburg, Pa.
Sanderson Bros. Steel Co., Cleveland, O.

Transmission Machinery—
Heyl & Patterson, Pittsburg, Pa.
Link-Belt Machinery Co., Chicago, Ill.
The Lane & Bodley Co., Cincinnati, O.
W. A. Jones Foundry & Machine Co., Chicago, Ill
Jeffrey Mfg. Co., Columbus, O.
Dodge Mfg. Co., Mishawaka, Ind.
The Aultman Co., Canton, O.
Brown Hoisting and Conveying Machine Co., Cleveland, Ohio.

Tubes—
National Tube Works, McKeesport, Pa.

Tube Welding—
S. Fix Sons, Cleveland, O.

Tumbling Mills—
The S. Obermayer Co., Cincinnati, O.

Turnbuckles—
Cleveland City Forge & Iron Co., Cleveland, O.

Twist Drills—
C. H. Besly & Co., Chicago, Ill.

Twist Drill Cases—
Vulcan Mfg. Co., Pittsburg, Pa.

Valves—
C. H. Besly & Co., Chicago, Ill.
Jenkins Bros., New York City.

Ventilating Fans—
B. F. Sturtevant Co., Boston Mass.

Vises—
Massey Vise Co., Chicago, Ill.

Wire Machinery—
The F. B. Shuster Co., New Haven, Conn.
S. W. Goodyear, Waterbury, Conn.
A. H. Nilson Machine Co., Bridgeport, Conn.

Wire Nails—
Cleveland Rolling Mill Co., Cleveland, O.
Shenango Valley Steel Co., New Castle, Pa.

Wood Pulleys—
Dodge Mfg. Co., Mishawaka, Ind.

Wrought Pipe—
National Tube Works, McKeesport, Pa.

Alphabetical List of Advertisers.

The star (*) indicates that the adv. appears alternate weeks; the dagger (†) once a month; the double dagger (‡) once in three weeks; the parallel (‖) three times out of four.

	PAGE
Ætna-Standard Iron & Steel Co	28
Ætna Fire Brick Co	32
Aitchison, Rob't, Perforated Metal Co	31
Allis & Co., Edward P	39
†American Gas Furnace Co	—
*American Pneumatic Tool Co	—
American Tin Plate Company	41
Apollo Iron & Steel Co	1
Armstrong Bros. Tool Co	1
Armstrong Mfg. Co	27
Aultman Co	2
Bacon, Earle C	29
Baird Machinery Co	23
Baush & Harris Machine Tool Co	44
Becker, August	1
*Berger Mfg. Co	28
*Bertsch & Co	—
Besly & Co., Chas. H	44
Bethlehem Iron Co	43
*Bickford Drill & Tool Co	—
Bickford, H	44
Blakeslee Mfg. Co	1
Bourne-Fuller Co	1-2-28
Bræburn Steel Co	37
Brainard Milling Machine Co	27
Brass Founders' Supply Co	26
Breitung, Edward N	29
Bristol Co., The	1
Britton & Co., J. Blodgett	2
*Brown, Edward	29
Brown Hoisting and Conveying Machine Co	30
Bucyrus Co	30
Cahall Sales Department	1
Central Electrotype & Engraving Co	42
*Champion Rivet Co	29
Chicago Fire Clay Product Co	32
Chicago & Northwestern Ry	33
*Chicago Die & Machine Co	37
Chicago Press Clipping Bureau	30
*Chicago Rawhide Mfg. Co	—
Chicago Screw Co	1
Clayton Air Compressor Works	2
Clearfield Fire Brick Co	32
Cleveland City Forge & Iron Co	1
†Cleveland Facing Mill Co	—
Cleveland Rolling Mill Co	28
Cleveland Tool & Supply Co	27
Clinton Iron & Steel Co	28
*C. M. & St. P. Ry	31
Cole, J. Wendell	44
Columbia Fire Clay Co	32
Covert Mfg. Co	30
Cramp & Sons, Wm	40
Crane & Co., B. P	43
Crescent Steel Co	37
Crowell Benedict	1
Delano, E. A	28
Diamond Fire Brick Works	32
Dickman & MacKenzie	2
Dixon, Jos., Crucible Co	40
*Dodge Mfg. Co	25
Dover Fire Brick Co	32
Eclipse Electrotype & Engraving Co	42
Emmerton, F. A	2
Enterprise Boiler Co	2
Erikson, Edward E	1
Fitzsimons & Co	32
*Fix Sons	37
Fleharty, J. H. & Co	—
Forster, Waterbury & Co	2
Fox Machine Co	1
Frick Coke Co., H. C	—
Gandy Belting Co	1
Garden City Sand Co	44
Gerlach, Peter & Co	33
Gobeille Pattern Co	29
Goodyear, S. W	37
Hall Steam Pump Co	27
Hanna & Co., M. A	33
Harrington & King Perforating Co	26
Harrington Son & Co., Edwin	1
Harrison Safety Boiler Works	44
Hartford Steam Boiler Insp. & Ins. Co	31
Heyl & Patterson	29
†Hickman & Williams	30
Holmes, Strachan & Co	—
Hooven, Owens & Rentschler Co	32
Hunt Robt. W., & Co	26
Illinois Central R. R	2
Ingersoll-Sargent Drill Co	43
Iron Clad Paint Co	2
Jeffrey Mfg. Co	40
Jenkins Bros	31
Jones & Co., John T	40
Jones Foundry & Machine Co., W. A	2
Jones & Laughlins, Ltd	1
Kentucky Fire Brick Works	41
Konigslow & Bro., E	23
La Belle Steel Co	37
Lake Superior Consolidated Iron Mines	38
Lane & Bodley	39
Lidgerwood Mfg Co	39
Link-Belt Machinery Co	39
Lorain Steel Co	40
Lusch, H. B	41
Main Belting Co	2
Marion Steam Shovel Co	38
Massey Vise Co	44
McDowell, Hanson	1
McKeefrey & Co	23
Meehan Boiler & Construction Co	28
Millers Falls Co	44
Millett Core Oven Co	44
†Modern Machinery	32
Morris & Bailey Steel Co	—
*National Engraving Co	37
National Tube Works Co	37
†Newport Sand Bank Co	43
Nilson, A. H., Machine Co	—
North American Metaline Co	27
Northampton Emery Wheel Co	44
Norwalk Foundry & Machine Co	38
Nuttall Co. The R. D	33
Oak Hill Fire Brick & Coal Co	26
Obermayer, S. & Co	22
Oglebay, Norton & Co	33
†Ohio Sand Co	26
Ohio Steel Co	—
Otis Steel Co	28
†Parkhurst & Wilkinson Co	22
Phœnix Horse Shoe Co	—
Playford Stoker Co	43
Pollock, The Wm. B. Co	40
Prescott Steam Pump Co	2
Q & C Co	39
Rand Drill Co	21
Reading Crane & Hoist Works	2
Riter-Conley Mfg. Co	30
Riverside Foundry Co	31
Rockford Bolt Works	22
Rockwell & Co., W. S	2
Ryan, J. J. & Co	—
Salisbury Carbonate Iron Co	26
Sanderson Bros. Steel Co	37
Seaman, Sleeth Co	42
Sennett Co., Geo. B	39
Scioto Star Fire Brick Works	32
‖Sharon Fire Brick Works	1
Shenango Valley Steel Co	23
Shiffler Bridge Co	31
Shuster, The F. B., Co	27
Skinner Chuck Co	27
Spearman Iron Co	44
Standard Paint Co	23
Stevens, F B	44
Stilwell-Bierce & Smith-Vaile Co	2
Stroud & Co., E. H	2
Sturtevant Co., B. F	1-25
*Superior Charcoal Iron Co	29
Swarts Metal Refining Co	1
Tabor Mfg Co	32
Textor, O	2
Tod, Wm. & Co	39
Union Mining Co	22
Union Boiler Tube Cleaner Co	1
United States Hotel Co	38
Upson Nut Co	1
Van Dorn & Dutton Co	26
Vitrified Wheel Co	38
Vulcan Mfg. Co	30
Washington Coal and Coke Co	33
Webster Fire Brick Co	1
Wells, Heber	29
White, Byron H	37
Wyman & Gordon	43

BRÆBURN STEEL COMPANY, Bræburn, Pa.
MANUFACTURERS OF
FINE TOOL STEEL AND FORGINGS. ALSO SPRING HAMMER, AND MACHINERY STEEL OF HIGH QUALITY. FINE OPEN-HEARTH STEEL.

DIRECTORS:
Wm. Metcalf,
Chas. Metcalf,
P. B. Hasbrouck.
R. P. Kelly,
Sec'y. and Treas.

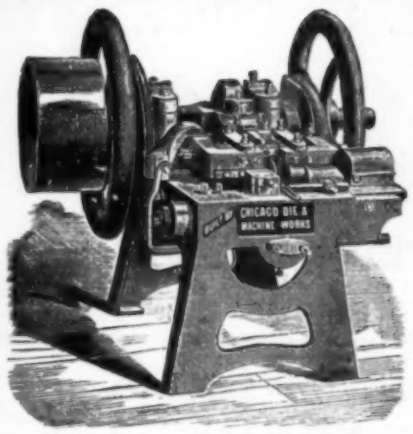
MORE WEAR from your tools
.....Almost no **STEEL EXPENSE**
NO TROUBLE
"It pays to use the most reliable tool steel in the market."
SANDERSON BROS. STEEL CO.
Cleveland Warehouse, 97 Water St.

ESTABLISHED 1865 * INCORPORATED 1889.
CRESCENT STEEL
CRESCENT STEEL CO.
480 PEARL ST. NEW YORK — PITTSBURGH, PA. — 64 & 66 S. CLINTON ST. CHICAGO.

La BELLE STEEL CO., Pittsburgh, Pa.
MANUFACTURERS OF FINE
CRUCIBLE CAST TOOL STEEL.
SPECIAL GRADES FOR ALL PURPOSES.
BYRON H. WHITE,
Western Selling Agent.
OFFICE AND WAREHOUSE: **68 and 70 South Canal St., Chicago.**

ECLIPSE
"ECLIPSE" COLD DRAWN
SHAFTING
FITZSIMONS & CO., CLEVELAND, OHIO.
BYRON H. WHITE WESTERN SELLING AGENT
WAREHOUSE & OFFICE 68—70 SO. CANAL ST. CHICAGO
BYRON H. WHITE, Western Selling Agent,
68-70 South Canal St., Chicago.

THE MORRIS & BAILEY STEEL CO. PITTSBURG, PA.
COLD ROLLED STRIP STEEL
FLAT & COILED FOR STAMPING, BLANKING DRAWING, SPRINGS ETC
BYRON H. WHITE
WESTERN SELLING AGENT
WAREHOUSE & OFFICE 68-70 S. CANAL ST. CHICAGO
BYRON H. WHITE, Western Selling Agent, CHICAGO.



CHICAGO DIE AND MACHINE WORKS
MANUFACTURERS OF
Bolt Forging Machines
NUT TAPPERS, IRON CUTTERS,
Power, Screw and Lever Presses, Dies.
Furnaces for Heating Ends of Iron for Bolts.
SPECIAL MACHINERY
87 to 91 West Lake St., Chicago.

Don't Waste Money in Your Pattern Shop.
THE GOBEILLE PATTERN CO., Cleveland.

Between the Lakes and the Gulf, the Mississippi and the Allegheny Mountains—the best buying section of the United States—is the BULK of THE IRON TRADE REVIEW'S circulation. In this section advertisers in all trade papers get best returns.

IRON AND STEEL MARKETS.

IRON ORE.

[On Lake Erie docks.]

Special low-phosphorus hard Ore, Bessemer	$4.75
No. 1 Specular, Bessemer	$3.15@3.50
No. 1 Bessemer hematite	3.75@3.25
Hematites No. 1 non-Bessemer	1.90@3.10
No 1. Specular, non-Bessemer	3.00@3.40
Mesabi Bessemer	1.80@3.00

PIG IRON.

CLEVELAND (f. o. b. cars):	
Bessemer	$14 65
No. 1 Strong Foundry	$14 50@15 00
No. 2 Strong Foundry	14 25@14 50
Gray Forge, red short	13 65
Gray Forge, neutral	13 50
No. 1 American Scotch	14 90@15 15
No. 2 American Scotch	14 40@14 65
Lake Superior Charcoal	15 00@16 00
PITTSBURG:	
No. 1 Foundry	$14 50@15 50
No. 2 Foundry	14 25@15 00
Gray Forge	13 50@14 00
White and Mottled	13 50
Warm Blast Charcoal	15 00@17 00
Cold Blast Charcoal	22 00@26 00
Bessemer	14 50@15 00
CHICAGO:	
Lake Superior Charcoal	$15 50@16 50
Local Coke Foundry No. 1	15 00@15 50
Local Coke Foundry No. 2	14 50@15 00
Local Coke Foundry No. 3	14 00@14 50
Local Scotch Foundry No. 1	15 00@15 50
Local Scotch Foundry No. 2	14 50@15 00
Local Scotch Foundry No. 3	14 00@14 50
Southern Coke No. 1	15 50@16 00
Southern Coke No. 2	15 00@15 50
Southern Coke No. 3	14 75@15 00
Southern No. 1 Soft	15 50@16 00
Southern No. 2 Soft	15 00@15 50
Southern Silveries	15 00@16 00
Jackson Co. Silveries	15 00@15 00
Ohio Silveries No. 1	.....
Ohio Strong Softeners	15 00@16 00
Alabama Car Wheel	17 50@18 00
Malleable Bessemer	15 00@15 50
Coke Bessemer	15 00@15 50
CINCINNATI (reported by Rogers, Brown & Co.)	
Southern Coke No. 1, Foundry	$14 00@14 25
Southern Coke No. 2 and No. 1 Soft	13 50@14 00
Hanging Rock Charcoal No. 1, Fdy	16 00@18 00
Tennessee Charcoal No 1	15 00@16 00
Jackson County Silvery No 1	15 00@15 50
Southern Coke, Gray Forge	13 75@13 00
" " Mottled	13 75@13 00
Standard Georgia Car Wheel	15 00@16 00
Lake Superior " "	15 50@16 00
BUFFALO:	
No. 1 Foundry Strong Coke Iron Lake Superior Ore	$14 25
No. 2 Foundry Strong Coke Iron Lake Superior Ore	13 75
Ohio Strong Softener No. 1	14 00
Ohio Strong Softener No. 2	13 50
Jackson Co. Silvery No. 1	15 60
Southern Soft No. 1	15 25
Southern Soft No. 2	14 75
Lake Superior Charcoal	14 00@14 50
Coke, Malleable	14 10
ST. LOUIS:	
Southern Coke No 1	$14 75
Southern Coke No. 2	14 25
Southern Coke No. 3	13 75
Southern Coke No. 4	13 55
Southern Gray Forge	13 80
Tennessee Charcoal No. 1	13 75
Jackson County 4 per cent Silicon	16 25
Lake Superior Coke No. 1	15 00@16 00
Southern Car Wheel	15 25@16 25
Genuine Connellsville Coke	4 15
West Virginia Coke	4 10

OLD RAILS AND SCRAP METAL.

[Delivered Cleveland.]	Gross Tons
Old iron rails	$17 00
Old steel rails (6 ft. and over)	13 00
Old steel rails (6 ft. and under)	12 00
Old car wheels	14 00
	Net Tons
No. 1 R. R. wrought scrap	$15 60
Mill scrap	10 50
No. 1 Machine cast scrap	11 00
Iron axles	18 00
Axle turnings	10 00
Wrought turnings (free from cast)	9 00
Cast borings	7 50
Uncut wrought iron boilers	6 00
Steel boiler plates	10 50
Grate bars	7 50
Pipes and flues (clean)	9 00
Tank iron	11 00
Hoop and band iron	8 00
Sheet iron	7 00
Wrought drillings	9 00
Malleable iron	9 50

STRUCTURAL MATERIAL.

Beams and Channels (f. o. b. Cleveland)	1.50c
Angles	1 40c
Tees	1.50c
Universal Plates	1.80@1.90c
Sheared Plates	2.00c

MERCHANT IRON AND STEEL.

[Less than car-lots, Cleveland.]

Rounds and Squares.—Bar Iron.

1 to 1½	1.45 Base.
2 to 2½	.20 extra.
3 to 3½	.50 "
3½ to 4	.60 "
4½ to 4½	1.00 "
4½ to 5	1.50 "
5½ to 6	1.0.80 "
5¼ to 6½	2.00 "

VITRIFIED EMERY AND CORUNDUM WHEELS. . .

FOR

Foundry and Machine Shop Work.

CAN BE RUN WET OR DRY.

SOLD BY
Weed & Co., Buffalo, N. Y.
Strong, Carlisle & Hammond Co., Cleveland, O.
Machinist Supply Co., Chicago, Ill.
Sligo Iron Store Co., St. Louis, Mo.

VITRIFIED EMERY WHEEL CO.,
Westfield, Mass.

Eddy Dynamo Electro-Plating Machines

FOR

BICYCLE PLATING PLANTS.

NORTHAMPTON EMERY WHEEL CO., 20 S. Canal St., Chicago, Ill.

EXCLUSIVE WESTERN SELLING AGENTS.

Weddell House.

Cleveland, Ohio.

THE U.S. HOTEL CO.
C.A. SWAN & W.L. BATES
MANAGERS

50 ROOMS AT $2.00
50 ROOMS AT 2.50
75 ROOMS AT 3 TO 4.00

All Meals 50¢ Each

LEVIATHAN

Belting

Is the strongest, runs the most evenly, and best adapted for Cotton, Woolen, Saw and Planing Mills, Brick and Tile Works and

Heavy Driving Generally.

MAIN BELTING CO.

1319-1235 Carpenter Street, PHILADELPHIA.
120 Pearl Street, BOSTON.
55 & 57 Market St., CHICAGO.

Metallurgy of Cast Iron, Price $3.00.

6⅝ to 7¼	2.50 extra
¾ to ⅞	.10 "
⅞ to 11-16	.20 "
⅛ to 9-16	.30 "
7-16 to 15-32	.40 "
⅜ to 13 2	.50 "
5-16 to / 32	.70 "
¼ to 9-32	.90 "
7-32	1.40 "
3-16	2.50 "

Flats.—Bar Iron.

1⅛ to 4 x ⅛ to 1	1.05 Base
4¼ o 6 x ⅛ to 1	.10 extra
6¼ o 8 x ⅛ to 1	.60 "
8¼ o 10 x ⅛ to 1	.80 "
1⅛ o 4 x 1 1-16 to 1⅛	.30 "
4¼ to 6 x 1 1-16 to 1⅛	.40 "
6¼ to 8 x 1 1-16 to 1⅛	.60 "
8¼ to 10 x 1 1-16 to 1⅛	.90 "
2 to 4 x 1⅛ to 2	.50 "
4¼ to 6 x 1⅛ to 2	.60 "
6¼ to 8 x 1⅛ to 2	.80 "
8¼ to 10 x 1⅛ to 2	1.00 "
2 to 4 x 2⅛ to 3	.60 "
4¼ to 6 x 2⅛ to 3	.80 "
6¼ to 8 x 2⅛ to 3	1.00 "
1⅛ to 1⅜ x ⅜ to 1	.10 "
1 to 1 1-16 x ⅜ to ⅝	.20 "
¾ to 15-16 x ⅜ to ⅝	.40 "
⅝ to 11-16 x ⅜ to ⅝	.50 "
½ to 9-16 x ⅜ to ⅝	.90 "

Heavy Band Iron.

7 to 10 x ¼ to 5-16	.70 extra.
6¼ to 6¾ x ¼ to 5-16	.50 "
4¼ to 6 x ¼ to 5-16	.30 "
1⅛ to 4 x ¼ to 5-16	.20 "
1 to 1⅜ x ¼ to 5-16	.30 "
¾ to 15-16 x ¼ to 5-16	.50 "
⅝ to 11-16 x ¼ to 5-16	.80 "
⅛ to 9-16 x ¼ to 5-16	1.00 "
⅜ to 7-16 x ¼ to 5-16	1.50 "

Heavy bands, 7-32 in. thick 1-10 c. per lb. higher than ¼ to 5-16 thick. **Bevel Edge Shaft Iron** 1-10 higher than same size of Heavy Bands.

Light Band Iron.

7 to 8 x No. 9 to 3-16	.90 extra
7 to 8 x Nos. 10, 11 and 12	1.00 "
6¼ to 6¾ x No. 9 to 3-16	.70 "
6¼ to 6¾ x Nos. 10, 11 and 12	.80 "
4¼ to 6 x No. 9 to 3-16	.50 "
4¼ to 6 x Nos. 10, 11 and 12	.60 "
1¼ to 4 x No. 9 to 3-16	.40 "
1¼ to 4 x Nos. 10, 11 and 12	.50 "
1 to 1 3-16 x No. 9 to 3-16	.50 "
1 to 1 3-16 x Nos. 10, 11 and 12	.60 "
13-16 to ⅞ x No. 9 to 3-16	.60 "
13-16 to ⅞ x Nos. 10, 11 and 12	.70 "
11-16 to ¾ x No. 9 to 3-16	.80 "
11-16 to ¾ x Nos. 10, 11 and 12	.90 "
9-16 to ⅝ x No. 9 to 3-16	1.00 "
9-16 to ⅝ x Nos. 10, 11 and 12	1.10 "
7-16 to ½ x No. 9 to 3-16	1.30 "
7-16 to ½ x Nos. 10, 11 and 12	1.40
⅜ x No. 9 to 3-16	1.50
⅜ x Nos. 10, 11 and 12	1.60

Bevel Edge Box Iron.

Same as Light Bands, of same sizes.

Beaded Band Iron, 1¼ in. to 2 in.

Sand Band Iron, 1-10 c. above same sizes o Light Bands.

Oval Iron.

⅞ to 1⅛	.40 extra.
¾ to 13-16	.50 "
⅝ to 11-16	.60 "
½ to 9-16	.80 "
⅜ to 7-16	1.10 "
⅛ to 9-16 x 3-16	1.00 "
⅝ to 11-16 x ⅛	1.20 "

Half Oval and Half Round.

2¼ to 3	.60 extra
⅞ to 2	.50 "
¾ to 13-16	.70 "
⅝ to 11-16	.90 "
½ to 9-16	1.20 "
⅜ to 7-16	2.50 "
5-16	3.50 "
¼	4.50 "

Half Ovals less than ¼ their width in thickness, extra price.

Horse Shoe Iron.

All sizes 1 c. extra.

Cutting ordinary bars to specified length, .20 to .30 extra, according to length and size.

Steel Bands.

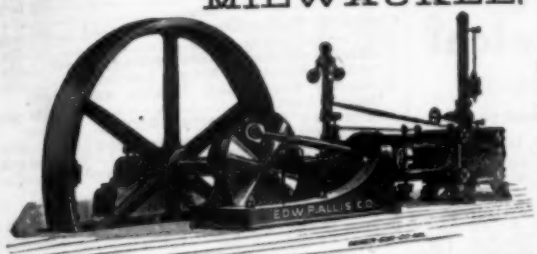
Width In Inches.	English Standard Gauge.		
1 1-2 to 6,	Nos. 7, 8, 9 or 3-16"	1.50	Base.
			Extras.
1⅛ to 6,	" 10, 11, 12 or 1/16"	.05	per 100 lbs.
1 to 1⅜,	" 7, 8, 9 or 3-16"	.10	"
1 to 1⅜,	" 10, 11, 12 or 1/16"	.15	"
13-16 and ⅞,	" 7, 8, 9 or 3-16"	.20	"
13-16 and ⅞,	" 10, 11, 12 or 1/16"	.25	"
11-16 and ¾,	" 7, 8, 9 or 3-16"	.30	"
11-16 and ¾,	" 10, 11, 12 or 1/16"	.35	"
9-16 and ⅝,	" 7, 8, 9 or 3-16"	.40	"
9-16 and ⅝,	" 10, 11, 12 or 1/16"	.45	"
½,	Nos. 7, 8, 9 or 3-16"	.55	"
½,	" 10, 11, 12 or 1/16"	.60	"
7-16	" 7, 8, 9 or 3-16"	.75	"
7-19	" 10, 11, 12 or 1/16"	.85	"
⅜,	" 7, 8, 9 or 3-16"	.95	"
⅜,	" 10, 11, 12 or 1/16"	1.05	"

Iron and Steel Hoops.

Width Inches.	English Standard Gauge.		
7-16 to 3	Nos. 13, 14, 15 and 16	1.60	Base
			Extras.
7-16 to 2,	" 17, 18, and 19	.05	per 100 lb
7-16 to 2,	" 20	.10	"
7-16 to 2,	" 21	.15	"
7-16 to 1½,	" 22	.25	"
¼ to 1½,	" 13, 14 and 15	.05	"
¼ to 1½,	" 16, 17 and 18	.10	"

THE EDWARD P. ALLIS COMPANY

MILWAUKEE, WIS.



MANUFACTURERS OF

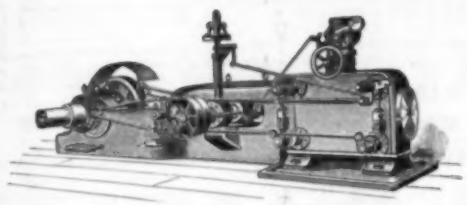
Blowing Engines, Hoisting Engines, Pumping Engines Air Compressors, Special Engines for Electric Lighting Street Railways and Rolling Mills, Ore Crushers, Crushing Rolls, Stamp Mills Concentrators, General Mining Milling and Smelting Machinery.

Reynolds Corliss Engines.

NEW YORK. CHICAGO. MINNEAPOLIS. DENVER. BUTTE. CITY OF MEXICO. SAN FRANCISCO. PITTSBURG.

THE LANE & BODLEY CO.,

CINCINNATI, OHIO.



Engines,

ALL SIZES.

Simple and Compound.

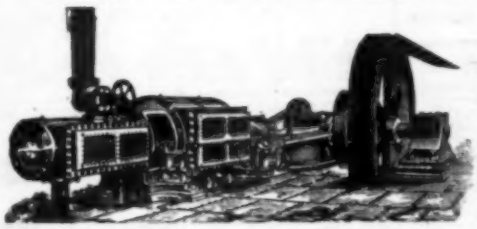
Shafting, Hangers, Pullevs.

Belt Elevators, Saw Mills.

WILLIAM TOD & CO.

YOUNGSTOWN, OHIO.

The Porter-Hamilton Engine



Reversing Engines, Blowing Engines, Converters, Hydraulic and special heavy machinery for the iron and steel trades.

Park Building, Pittsburg.

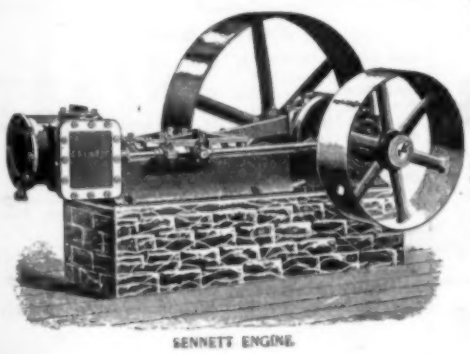
SEWARD S. BABBITT.

Who builds the best Mine Pump?

PRESCOTT.

Fred. M. Prescott Steam Pump Co.,

MILWAUKEE, WIS.



SENNETT ENGINE.

THE GEO. B. SENNETT CO.,

YOUNGSTOWN, OHIO.

MANUFACTURERS OF THE

Sennett Slide Valve Engine.

A well made and durable center crank engine of from 20 to 40 h. p. The design is thoroughly modern and all parts are made in duplicate. Engines kept in stock ready to run. Catalogues or prices willingly furnished. Among our other specialties are the

Sennett Compressed Couplings.

(See advertisement next week.)

Foundry contracts solicited for Castings from 10 lbs. to 5 tons each.

1⅛ to 1⅜,	"	19 and 20	per 100 lbs.
1⅛ to 1⅜,	"	21	.30 "
1⅛ to 1⅜,	"	22	.30 "
15-16 and 1,	"	13, 14 and 15	"
15-16 and 1,	"	16, 17 and 18	.15 "
15-16 and 1,	"	19 and 20	.20 "
15-16 and 1,	"	21	.25 "
15-16 and 1,	"	22	.35 "
⅞,	Nos.	13, 14 and 15	.20 "
⅞,	"	16, 17 and 18	.25 "
⅞,	"	19 and 20	.30 "
⅞,	"	21	.35 "
⅞,	"	22	.45 "
¾ and 13-16	Nos.	13, 14 and 15	.30 "
¾ and 13-16	"	16, 17 and 18	.35 "
¾ and 13-16	"	19 and 20	.40 "
¾ and 13-16	"	21	.45 "
¾ and 13-16	"	22	.50 "
¾ and 13-16	"	23	.60 "
11-16,	Nos.	13, 14 and 15	.35 "
11-16,	"	16, 17 and 18	.40 "
11-16,	"	19 and 20	.50 "
11-16,	"	21	.60 "
11-16,	"	22	.70 "
11-16,	"	23	.80 "
⅝,	Nos.	13, 14 and 15	.40 "
⅝,	"	16, 17 and 18	.45 "
⅝,	"	19 and 20	.55 "
⅝,	"	21	.65 "
⅝,	"	22	.75 "
⅝,	"	23	.85 "
9-16,	"	13, 14 and 15	.45 "
9-16,	"	16, 17 and 18	.50 "
9-16,	"	19 and 20	.60 "
9-16,	"	21	.70 "
9-16,	"	22	.80 "
9-16,	"	23	.90 "
½,	"	13, 14 and 15	.55 "
½,	"	16, 17 and 18	.60 "
½,	"	19 and 20	.70 "
½,	"	21	.80 "
½,	"	22	.90 "
½,	"	23	1.00 "
7-16,	"	13, 14 and 15	.80 "
7-16,	"	16, 17 and 18	.90 "
7-16,	"	19 and 20	1.00 "
⅜,	"	13, 14 and 15	1.00 "
⅜,	"	16, 17 and 18	1.10 "
⅜,	"	19 and 20	1.20 "

Sheet Iron.

No. 10	1 50
No. 12	1 70
No. 14	1 60
No. 15-17	1 75
No. 18	1 85
No. 20	2 00
No. 22-24	2
No. 25-26	2 20
No. 27	2 30

English Tool Steel.

Jessop's	15½c
Hobson's "Best"	15½c
" "Choice"	35c

Steel Boiler Plates—1-4 in. and Heavier.

Tank	1 35
Shell	1 45
Flange	1 35
Marine Flange	1 60
Fire Box	2 05

Above includes plates 90 inches wide.

90 to 96 in. wide	½c. lb. extra
96 to 100 in. wide	1c. "
100 to 104 in. wide	1½c. "
104 to 106 in. wide	special.

Flats.	cts. lbs.
2 to 9-16 in. wide by 2 to ½ thick	.08

Bessemer and O. H. Steel.

Bessemer Machinery	base price, 1 40
Open-hearth Tire	" 1 45
Open-hearth Spring	" 1 80
Sleigh Shoe	" 1 45
Toe Calk	" 1 90
Cutter Shoes, tapered and bent	" 1 60

American Cast Tool Steel.

ROUND, SQUARE, AND OCTAGON.	cts. lbs.
1 to 2 in. inclusive	.08
9-16 to ½ in. "	.08
7-16 to ⅜ and 2⅜ to 3 in.	.09
3⅜ to 4 in	.09½
⅜ to 11-16 and 4⅛	.10
⅛ to 6 in	10½
¼ to 9-32 and 6⅛ to 7 in	.11
1 in	.13

Burden Boiler Rivets.

⅛, ⅝, 11-16 and ¾ inches diameter	3 00
Bridge ⅛, ⅝, 11-16 and ¾ inch diam.	2 55

Wrought Pipe and Boiler Tubes.

Lap weld black, base, and 10 per cent	.78
Butt " " " "	.73
Lap " galv. " "	.70
Butt " " " "	.67
Boiler tubes 2¼" and smaller	.72½
Boiler tubes 2½" and larger	.75
Casting screw and socket joint	dis. 50
Casing inserted joint	dis. 45

MACHINERY SUPPLY MARKET.

[From Store, Cleveland.]

Anti-Friction Metals.

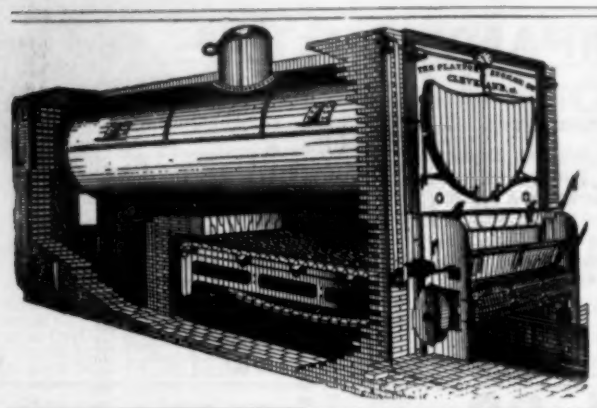
Magnolia Anti Friction Metal, 25 cts per lb f. o. b New York or Chicago.
No Name Metal, 15 cts per lb., f. o. b. New York or Chicago.
Mystic Metal, 10 cts. per lb, f. o. b. New York or Chicago

Anvils.

American	₩ lb 0@14
Wright's	₩ lb 19

Bellows.

Blacksmiths'	Hill's dis
	Bullock's dis 50 & 1
Moulders'	dis 40@40&10
Hand	dis 40&10@50



The Playford Mechanical Stoker

Guaranteed to

Abolish smoke, to increase boiler capacity and to save fuel.

For information, address,

The Playford Stoker Co.,

404 Telephone Bldg.,

CLEVELAND, O.

IRON CLAD PAINT CO.

Factory, 75 & 77 Central Way. Sec. & Treas., No. 3 Case Build'g.

CLEVELAND. OHIO.

ORDER DIRECT FROM THE

Iron Clad Paint Co.

And get the genuine article, and save liability of suit for using an article made in violation of the patents issued to Wm. Green, and now owned by this Company.

IRON CLAD PAINT is the most durable, most fire-proof and Cheapest Paint made.

FURNISHED both Dry and Ground in Oil

USED BY NEARLY ALL THE RAILROADS.

We Claim The Following Merits for Jenkins Bros.' Valves

1. Manufactured of the best Steam Metal.
2. No regrinding, therefore not constantly wearing out the Seat of the Valves.
3. Contain JENKINS DISC, which is suitable for all Pressures of Steam, Oil and Acids.
4. The Easiest Repaired, and all parts Interchangeable.
5. Every Valve Tested before leaving the factory.
6. ALL GENUINE stamped with Trade Mark,

(2)

JENKINS BROTHERS, NEW YORK, PHILADELPHIA, CHICAGO, BOSTON.

Dixon's Pure Flake Graphite

Is a Blessing to Every Engine Room and Machine Shop.

A small quantity added to any Oil or Grease largely increases its lubricating value and makes the finest Cooling Mixture.

Pamphlet and Sample Sent Free.

JOS. DIXON CRUCIBLE CO., Jersey City, N. J.

FOR GREAT TENSILE STRENGTH, ELASTICITY AND ELONGATION, COUPLED WITH UNUSUAL NON-CORROSIVE QUALITIES,

Castings and Propeller Wheels

MADE FROM

PARSONS MANGANESE BRONZE

CANNOT BE EXCELLED. WRITE FOR PARTICULARS.

SOLE MAKERS,

THE WILLIAM CRAMP & SONS

Ship and Engine Building Company,

PHILADELPHIA, PA.

A paper that is paid for and read—THE IRON TRADE REVIEW.

Belting.

Boston Belting Co.'s standard	dis 70 & 10
" " " extra	dis 60&10
" " " best	dis 55
Cleveland Rubber Co. extra standard	dis 60&10
Hoyt's Short Lap	dis 50
Shultz Raw Hide Leather Belting, single	dis 40
Munson's Short Lap Single Leather	dis 50
Munson's Short Lap Double and Light Double Leather	dis 50&10
Shultz Raw Hide Leather Belting, Double and Light Double	dis 40
Standard, oak tanned	dis 50&10
Alexander Brothers' pure oak tanned	dis

Blowers and Exhausters.

B. F. Sturtevant's	dis 30
Boston Blower Co.	dis 35

Chucks.

Cushman's 4 Jaw Independent	dis 45
" Combination	dis 40
" Geared Scroll	dis 50
" 2 Jaw Brass Workers	dis 30
" Drill	dis 35
Wescott's Scroll Combination	dis 33⅓
" Independent	dis 40
" Little Giant Drill	dis 33⅓
Horton's Independent	dis 45
Whiton's Independent	dis 45
National Combination	dis 45
Sweetland "	dis 40
Almond Drill	dis 40
Morse "	dis 20
Skinner's Combination Lathe	dis 40&15
" Independent Lathe	dis 40&10
" Universal Lathe	dis 40&10
" Drill	dis 30

Cutters and Reamers.

Cleveland	dis 10@15
Pratt & Whitney	dis 10@15
Standard	dis 10@15
Morse	dis 10 to 15
Brown & Sharpe, Milling Cutters	dis 15
" " Gear Cutters	dis 15

Crowbars.

Cast Steel	₩ 3¼
Iron, steel points	₩ lb 1

Drill and Drill Sockets.

Twist Drills	
Morse Taper&Straight Shank to 1½"	dis 50 &10 to 60
Morse Taper and Straight Shank Larger than 1½"	dis 25
Drill Sockets	dis 25
Standard Twist Drills	dis 60@60&5
Cleveland " "	dis 60@60&5

Emery.

	No. 4 to 46 gr.	No. 54 to 150 gr.	Flour, C. F F. F
Kegs, ₩ lb	4½c	5 c	2½c
½ kegs ₩ lb	4½c	5½c	2¾c
¼ kegs ₩ lb	5 c	5½c	3 c
10 lb cans, 10 in case	6 c	6½c	c
10 lb cans less than 10	10 c	10 c	½c

Emery Cloth and Paper.

Barder, Adamson & Co.	dis 50@50&5
H. H. Barton	dis 50@50&5

Emery Wheels.

Detroit	dis 60@70
Norton's	dis 60@70
Crant	dis 60@70
Sterling	dis 60@70
Celluloid	dis 10&33⅓
Northampton	dis 50
Crystal	dis 65@70
Vitrified	dis 60@70
Vulcanite	dis 60&10
Hamden	dis 60&10@70
Cyclone	dis 60@60&10

Files.

Arcade	dis 60&10@60&10&10
Nicholson	dis 60&10@60&10&10
" X. F	dis 25
Kearney & Foot	dis 60&10@60&10&10
Black Diamond	dis 60&10@60&10&10
McClellan	dis 60&10@60&10&10
Disston's	dis 65@70
Western	dis 70
Stub's	dis 2
Grobet's	dis 30
Reynolds Bros.' Hand Cut	dis 55
Industry File Works Hand Cut	dis 50

Hammers.

P. S. W	dis 40
Atha new list, Jan. 15, 1887	dis 50
Heavy hammers and sledges under 5 lbs	10c
" " " " over 5 lbs	8c

Jack Screws.

Illinois Bolt Co. list	dis 75

Nuts and Washers.

Size of bolt inches	¼	5-16	⅜	½	⅝	¾	1
Square	8	7	5½	4½	4	3½	3⅛
Hexagon	15¾	11⅝	8⅝	6	5¼	5⅛	
Washers	9	8	7	5	4⅜	4¼	4⅛

In lots less than 100 lbs, ₩ lb add ½c., 1 lb boxes add 1c to list.

Nails (wire).

Standard Penny Nails, ₩ keg, base.

Car lots $1.30

Less than car lots $1.4

Oilers.

Zinc and Tin	dis 6
Brass and Copper	dis 50
Malleable (Hammer's), No. 1, $3.60; No. 2, $4.00; No. 3, $4.40 ₩ doz	dis 10@10&15

Picks.

Railroads, 5 to 6 lbs	dis $12 60
" 6 to 7 lbs	dis $13 50

JONES & LAUGHLINS, Limited,

PITTSBURG, PA.

Branch House, CHICAGO, ILL. Branch Office, 220 Broadway, NEW YORK.

MANUFACTURERS OF

ACID OPEN HEARTH,
BASIC OPEN HEARTH and
BESSEMER STEEL INGOTS,
BLOOMS AND BILLETS,
OF STANDARD GRADE.

THE

LORAIN STEEL COMPANY,

Lorain, Ohio.

Rails, Blooms, Billets and Slabs.

American Tin Plate Company

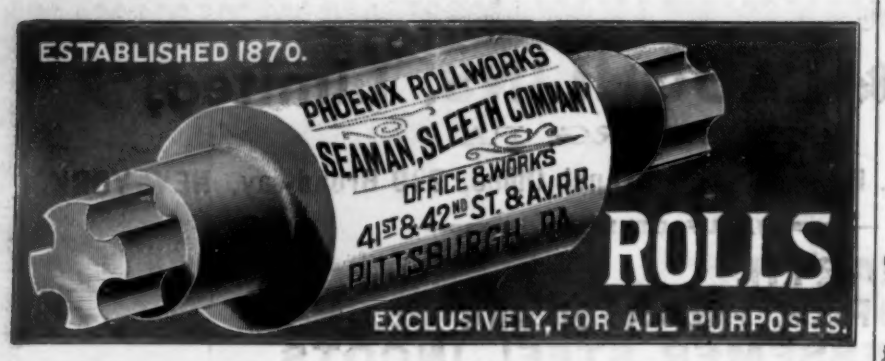
MANUFACTURERS OF

Coke Tin Plates,
Charcoal Tin Plates,
High Grade Terne Plates,
Black Plates.

GENERAL OFFICES:

Marquette Building.

CHICAGO, ILL.



The Iron Trade Review

Pays special attention to iron ore, blast furnace, rolling mill, foundry and machine shop interests. Per year **$3.00.**

Rivets.

Iron, Thousand, list November 1, 1894	dis 60@60
Iron, Ordinary, Cooper's Block and Carriage list November 1, 1894	dis 60@65
Copper	dis 50@50&15

Taps.

Cards, Hand and Nut to 2 in.	dis 50
Carpenters' " " "	dis 50
Morse " " "	dis 50
Pratt & Whitney " " new list	dis 10
Machine Screw Taps	dis 55
Pipe Taps to 2¼ in.	dis 70
Stay Bolt Taps	dis 25
Stove Bolt Taps	dis 55
Pulley Taps	dis 40

Vises.

Solid Box	dis 60
Parker's	dis 20@25
Prentiss	dis 20
Stephen's	dis 25@30
Barrett's	dis 30
Miller's Falls	dis 40
Merrill's	dis 15@20
Howard	dis 35

Wire.

List, Apr. 9, 1894

Brass	dis 35c
Copper	dis 35c
Bright and annealed, Nos. 0@18	dis 70&10@75
" " Nos. 19@26	dis 75@75& 5
" " Nos. 27@36	dis 75&10& 5
Coppered Nos. 0 to 18, market list	dis 70@70& 5
Galvanized Nos. 0 to 18 " "	dis65& 5
Tinned market Nos. 0 to 18	dis 67½
Cast steel	dis 50
Tinned Broom Wire	dis 70&5@70&10
Annealed Fence, Nos. 8 and 9	dis 75
Annealed Grape, Nos. 10 to 14	dis 75
Stub's Steel Wire regular	95c ₩ lb dis 30

ECLIPSE ELECTROTYPE AND ENGRAVING CO.
58 FRANKFORT ST.
TELEPHONE MAIN-1916. CLEVELAND, OHIO.

THE CENTRAL ELECTROTYPE AND ENGRAVING CO.
263-271 St. Clair St. Cleveland, O.
GOOD ENGRAVING ELECTROTYPING.

The Cleveland Terminal & Valley R. R. Co

(B. & O. System.)

Depot foot of So. Water St. City Office 241 Superior St.	Arrive.	Depart.
Valley Jctn. & Way Stations.	*6:25 P M	*7:25 A M
Marietta, Wheeling & Chicago	†9:25 P M	†7:25 A M
Cleveland Press Special	†9:25 P M	†2:00 P M
Akron, Canton & Wheeling	*10 20 A M	*3:30 P M
Akron, Canton & Chicago	*8 05 A M	*6:35 P M
Akron, Canton & Marietta	†2:10 P M	†11:00 A M
Pittsburg, Washington, D. C., & Baltimore	*11:30 A M	†2:00 P M
Akron Theatre Train		†11:10 P M

†Daily except Sunday. *Daily. Pullman's Palace Vestibule sleeping cars between Cleveland and Chicago, also Cleveland and Baltimore.

Molders' Text Book, Price $2.50.

MONON ROUTE
CHICAGO INDIANAPOLIS & LOUISVILLE RAILWAY

THE
DIRECT LINE
BETWEEN
Chicago . .
Indianapolis
Cincinnati .
Lafayette . .
Louisville . .
AND ALL POINTS
SOUTH
For time table and other information, address
FRANK J. REED, General Passenger Ag't,
CHICAGO.

Cleveland, Lorain & Wheeling

Railroad Company.

Time Table effective May 15th, 1898.

Cleveland Depot: Foot of South Water Street.
Elyria Depot: Huron St., West Side.

South Bound.			Central Standard.		North Bound.		
15	13	11	Lorain Branch	12	14	16
P.M.	P.M.	A.M.	LV. AR.	A.M.	A.M.	P.M.
4:25	2:25	6:27	Lorain	9:15	11:35	7:30
4:40	2:30	6:44	Elyria	9:00	11:21	7:16
4:56	2:55	7:04	Grafton	8:43	11:07	6:58
5:15	3:12	7:23	Lester	8:25	10:50	6:40
5	3	1	Main Line	2	4	6
5:30	2:25	7:30	Cleveland	8:30	11:50	7:15
5:47	2:41	7:36	Brooklyn	8:14	11:34	7:01
6:42	3:26	8:22	Lester	7:29	10:49	6:19
6:52	3:35	8:30	Medina	7:16	10:37	6:07
7:05	3:46	8:41	Chippewa La	7:04	10:26	5:55
7:20	4:01	8:56	Sterling	6:48	10:12	5:40
8:09	4:46	9:45	Massillon	6:00	9:23	4:54
8:55	5:31	10:34	Canal Dover.	5:11	8:36	4:10
9:02	5:38	10:41	New Philade	5:04	8:28	4:03
9:20	6:05	11:25	Uhrichsville	4:45	8:10	3:45
	8:10	1:30	Bridgeport		6:05	1:40
	8:25		Bellaire		5:50	
P.M.	P.M.	P.M.	AR. LV.	A.M.	A.M.	P.M.

No. 9 leaves Lorain 9:50 a.m., Elyria 10:05, Grafton 10:21; arrives Lester Junction 10:40. No. 10 leaves Lester Junction 3:25 p m., Grafton 3:42, Elyria 3:57; arrive Lorain at 4:10 p.m.

Trains 1, 2, 5 and 6 daily between Cleveland and Urichsville. All other trains daily except Sundays. Electric cars between Bridgeport and Wheeling, and Bridgeport and Martins Ferry and Bellaire. Consult agents for general information as to the best routes and passenger rates to all points.

M. G. CARREL, G. P. A.,
Hickox Bldg., Cleveland, O.

When you write to firms advertised in our columns, please mention the fact that you took their address from our paper. They will thank you for it.

DIRECTORY

To the Iron and Steel Works of the United States for 1898.

PUBLISHED BY
THE AMERICAN IRON AND STEEL ASSOCIATION.

Thoroughly Revised. Price, Seven Dollars.

The American Iron and Steel Association has just completed a thorough revision of its Directory to the Iron and Steel Works of the United States, bringing down to April, 1898, a description of these works. It also contains a complete Directory to many leading industries which are large consumers of iron and steel. This edition, which is the fourteenth that has been issued, embraces more complete details of all the iron and steel works of the United States, and of industries which are large consumers of iron and steel, than any preceding edition. It retains all the old features of preceding editions and contains many new features.

In the edition for 1896 there was given for the first time a complete list of Malleable Iron Works in the United States, and to this new feature there are now added complete lists of the Rail Mills, Structural Mills, Steel Casting Works, Bolt, Nut and Rivet Works, Chain Works, Seamless Tube Works, and Riveted Pipe Works—all new features.

The lists of Plate and Sheet Mills and of Tin Plate and Stamping Works are much more complete than in previous editions. The names and location of all the works described are given in alphabetical order, followed by a description of their character, capacity and products, with the names of the principal officers, etc., including the names of selling agents. This edition makes a cloth-bound book of nearly 400 well-printed pages—many more than in any previous edition. It contains a complete list of all the

Blast Furnaces,
Rolling Mills,
Bessemer Steel Works,
Open-Hearth Steel Works,
Crucible Steel Works,
Plate and Sheet Mills,
Rail Mills,
Structural Mills,
Steel Casting Works,
Cut-Nail Works,
Tin Plate Works,
Stamping Works,
Forges and Bloomaries,
Wire Rod and Wire Mills,
Wire Nail Works,
Iron and Steel Bridge Builders,
Iron and Steel Ship Builders,
Horse-Nail Works,
Locomotive Works,
Malleable Iron Works,
Cast Iron Pipe Works,
Cast Iron Soil and Plumbers' Pipe Works,
Wrought Iron, Wrought Steel and Riveted Pipe Works,
Seamless Tube Works,
Chain Works,
Bolt, Nut and Rivet Works,
Car Axle Works,
Car Wheel Works, and
Car Builders in the United States

ALSO A LIST OF THE

Iron and Steel Works in Canada and Mexico.

This edition of the Directory is an invaluable book of reference for all business men who wish to correspond with iron and steel manufacturers or with iron and steel consumers, forming, in every respect, a COMPLETE GUIDE to the iron and steel works of this country and to the principal works which consume iron and steel.

Sent postpaid, on receipt of price, by

THE IRON TRADE REVIEW CO.,
PITTSBURG, CLEVELAND, CHICAGO.

PHOENIX HORSE SHOE C°.

Phoenix Horse Shoes are known of everywhere as the best. The superior quality of material and excellence of manufacture are beyond all question. They have no equal.

JOLIET, ILL. AND POKEEPSIE N. Y

WEST AND SOUTH

run the lines of the Illinois Central Railroad and the Yazoo & Mississippi Valley Railroad, reaching into the eleven States of

South Dakota	Kentucky
Minnesota	Tennessee
Iowa	Arkansas
Wisconsin	Mississippi
Illinois	Indiana Louisiana

Presenting an unequaled territory for diversified industries, and possessing

Fine Sites for New Mills

Best of Freight Facilities,—Coal Fields,

Close Proximity to Distributing Centers,

Intelligent Help of All Kinds,

Many Kinds of Raw Material.

To sound industries, substantial inducements will be given by many of the places concisely described in the pamphlet "100 Cities and Towns Wanting Industries." Write for a copy. Nearly all kinds of industries are wanted. Very liberal inducements are offered **TEXTILE INDUSTRIES** in the South by a number of good places. GEORGE C. POWER, Industrial Commissioner I. C. R. R. Co., Chicago. I. 2-98.

Steel Stamps and Stencils.

FULLHARTY, J. H. & Co., Rubber Stamps Seals, Stencils, Automatic Check Punches and Numbering Machines. 92 Seneca St

If you are thinking of enlarging your mill, foundry or machine shop, or of purchasing machinery of any kind, send us a line giving character of machinery needed. We can put you in communication with manufacturers from whom you can buy advantageously.

...Nickel Steel Forgings...

For Locomotive Crosshead Pins, Crank Pins, Piston Rods and Driving Axles.

SEND FOR PAMPHLET.

THE BETHLEHEM IRON COMPANY,

SOUTH BETHLEHEM, PA.

BRANCH OFFICES:

100 Broadway, N. Y. 421 Chestnut St., Philadelphia. 1433 Marquette Building, Chicago.

National Tube Works Company,

MILLS AT McKEESPORT, PA.

The largest makers of Special Mild Steel and Wrought Iron Pipe, Boiler Tubes and Casing in the World. From ore to finished product. Sizes from ⅛ of an inch to 30 inches.

SALES HOUSES:

Pittsburg, Chicago, St. Louis, New York, Boston.

Hydraulic Pressed Forging.

WYMAN & GORDON, Worcester, Mass.

New York Office: 116 Liberty st.

DROP FORGINGS.

The A B C of Iron.—A book for foundrymen. It is issued in cloth binding, and gives much valuable matter on how to reduce cost of mixtures, and on grading and numbering of pig iron. CHAPTER HEADINGS:—Iron—What is it? Pig Iron. Constituents of Iron. Numbering of Pig Iron. Grading of Iron. How to Reduce Cost of Mixture. Steel. Physical Properties of Metals Defined. Statistics. Early History and Manufacture of Iron. Former price $2.00, NOW $1.00. Order of *The Iron Trade Review Co.*, 27 Vincent St., Cleveland, O.

B. P. CRANE & CO.

TERNE AND TIN PLATES.

L. D. Telephone, MAIN 841. 205 LA SALLE ST.

CHICAGO.

PIG IRON

Spearman Iron Company,

Sharpsville, Pa.

Inspected Foundry Irons. Softness, Strength, Fluidity, Uniformity.

American Scotch

brand unequaled.

HENDERSON & TRAGO, Agents,
CLEVELAND, O.

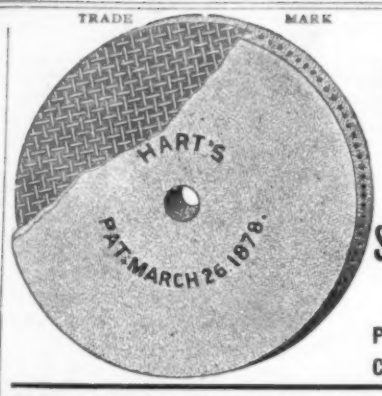
The Practical Brass and Iron Founder's Guide.

A treatise on brass founding, molding, the metals and their alloys, etc. By JAMES LARKIN, late conductor of the brass foundry department in the Penn Works, Philadelphia. A new revised and greatly enlarged edition. Contents: Among the most important and entirely new sections of this edition of this valuable and popular book are the following: Behavior of Metals and Alloys in Melting and Congealing; Malleable Iron Castings; Wrought Iron or Mitis Castings; Manufacture of Steel Castings; Casting of Brass; Casting of Bronze; Bell Founding; Chill Casting; Casting without Core; Casting onto Other Metals; Casting Iron and Other Metals upon Lace, Embroideries, Fern Leaves and Other Combustible Materials; Some Modern Bronzes. In one volume; 12mo; 400 pages . . $2.50

Sent postpaid on receipt of price by

The Iron Trade Review Co.,

CLEVELAND.
CHICAGO.
PITTSBURG.



DETROIT
Emery-Corundum WHEELS,
Sellers' Tool and Twist Drill Grinders.

J. WENDELL COLE,
P. O. Box 84, COLUMBUS, OHIO.
911 No. 112 Clark St., CHICAGO, ILL.

BAUSH & HARRIS MACHINE TOOL CO.,
Springfield, Mass.

Manufacturers of
Radial Drills,
Multiple Spindle Drills,
Universal Radial Drills,
Boring and Turning Mills.

HIGH GRADE ONLY. Write for Prices.

Meehan Boiler & Construction Co.,
LOWELLVILLE, OHIO,
MANUFACTURERS OF
MEEHAN'S COMBINED SAFETY and WATER TUBE BOILER.
All kinds of Blast Furnace, Steel Plants and Stand Pipe Work.
Also all kinds of Oil Refinery and Tank Work.
WROUGHT IRON WELDED and RIVETED ANNEALING BOXES.
Structural and Engineering Work.

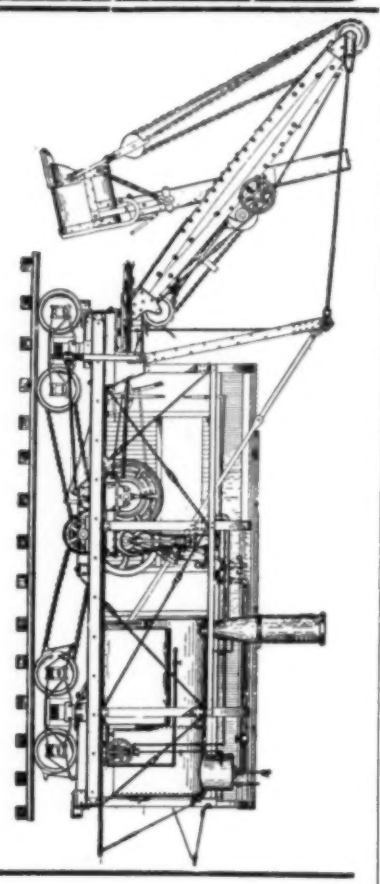
The "ORIGINAL GANDY"
Stitched Cotton Duck Belting,
Especially adapted for Main Drivers, Saw Mills, Cotton Gins, Cotton Presses, and for all places where belts are subjected to moisture or atmospheric changes, the "GANDY" stands paramount.
For further information, prices, etc., write
The GANDY BELTING CO., Baltimore, Md.

Steam Shovels
FOR
Iron Mining.

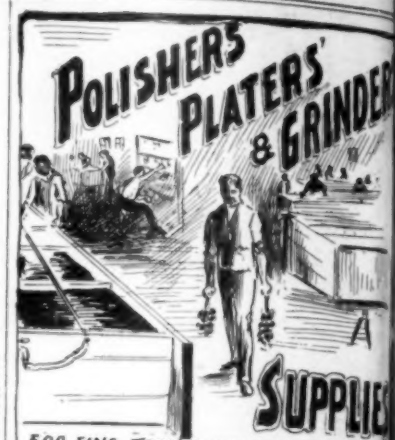
We have machines of new designs with hoisting, swinging and crane engines. These were designed and constructed especially to meet requirements of iron mining and coal mining fields.

WE INVITE MOST RIGID INVESTIGATION.

For full information address
THE
MARION STEAM SHOVEL CO.
Marion, Ohio.

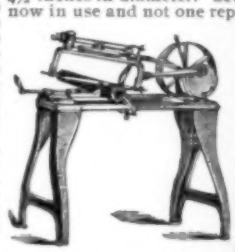


When writing to advertisers please mention The Iron Trade Review.


POLISHERS PLATERS & GRINDERS
SUPPLIES
FOR FINE TOOLS & METAL WORKERS SUPPLIES
SEND FOR 300 PAGE ILLUSTRATED CATALOGUE
10-12 N. CANAL ST.
C. H. BESLY & CO
CHICAGO ILL. U.S.A.

LEADS THEM ALL,
THE
Harrington Chain Block.
Made in Philadelphia Only.
EDWIN HARRINGTON SON & CO., Inc.,
1526 Penna. Ave., PHILA., PA.
Improved Machine Tools.

The STAR Hack Saw Machine
FOR CUTTING METALS of all kinds up to 4½ inches in diameter. Several thousands are now in use and not one report has reached us that has not been complimentary. They are automatic, stopping themselves when cut has been made and no further attention is required than to adjust the work at the start. A man at work on some other machine usually attends to this. No shop can afford to be without one or more. They will save their cost over and over again. **Price $25.00.**



Millers Falls Co., 93 Reade St., New York.

Send for Photograph and Low Price.

A large and growing circulation among machine shop and foundry firms has
THE IRON TRADE REVIEW.

OILLESS BEARINGS

For Loose Pulleys and other bearings. Perfectly clean. No cutting of danger of fire from overheating. Send for Loose Pulley circular.
No. American Metalline Co.
40 to 48 Third Street, Long Island City, N. Y.

Fire Brick, Fire Clay, Pig Iron
F. B. STEVENS, Detroit, Mich.